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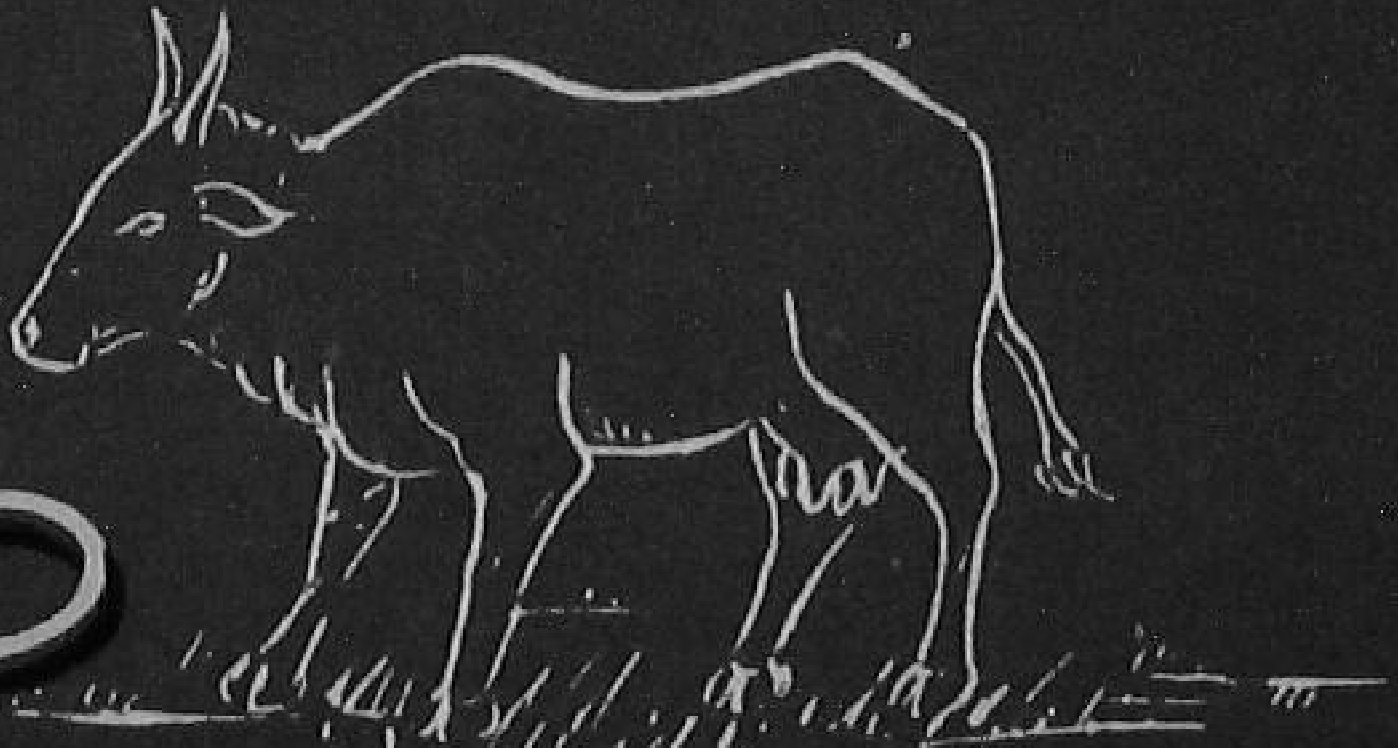

a Symposium

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MILK

A SYMPOSIUM

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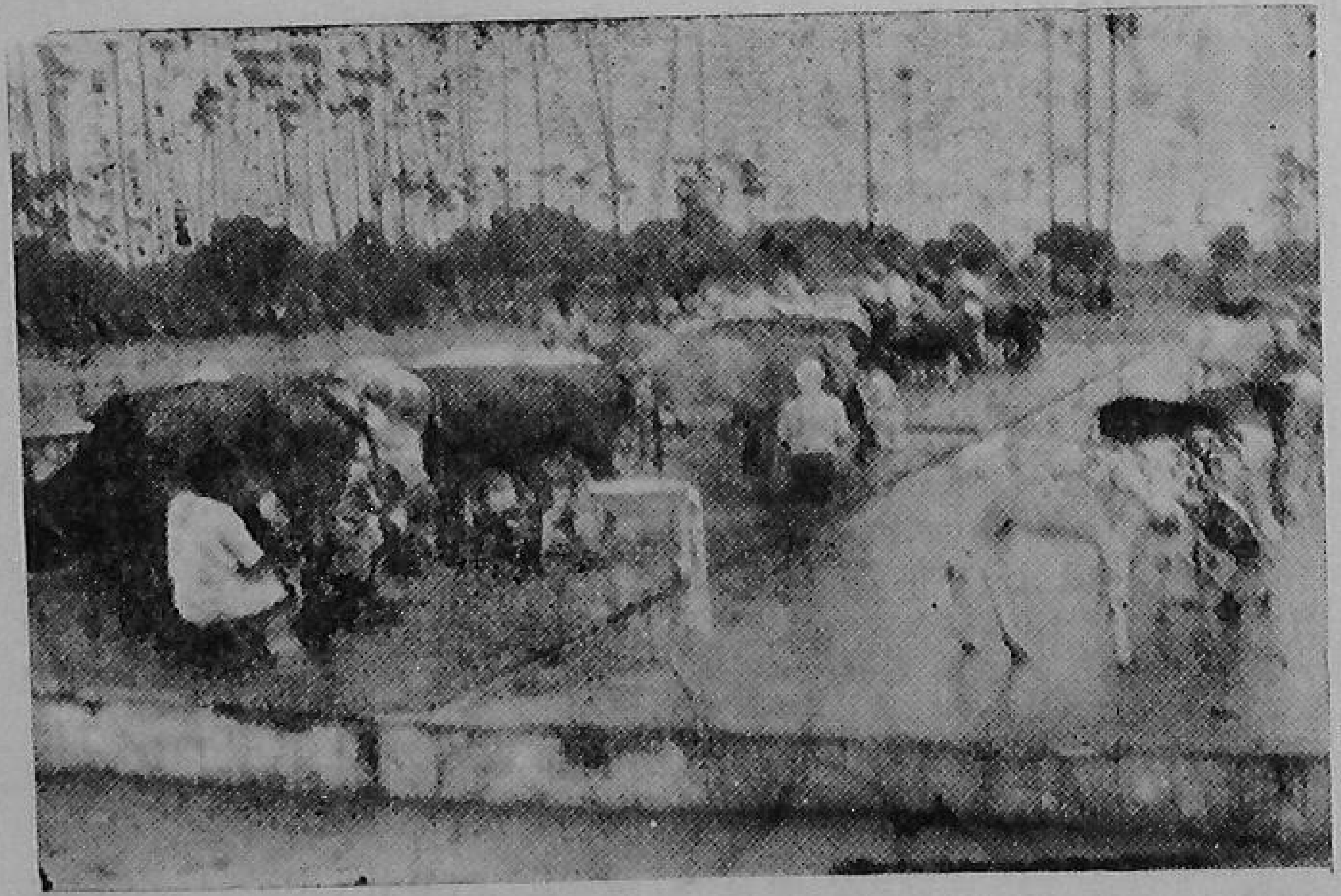
FOREWORD

Much has been said and written both by experts and laymen regarding the nutritional properties of Milk and its important place in a Balanced Diet. That Milk has vitalising qualities and should form an indispensable item in our dietary none will deny. In our country the bulk of the people take vegetarian diet and according to experts these are deficient in some necessary properties which could be made up only by an adequate consumption of Milk. The minimum prescribed is 16 oz. but the actual figure in Madras State is only something around 4 oz. We have therefore to travel a long way to reach the minimum target. This is a matter of utmost importance. Compared to the level of public health in other countries that in our country is already low and it is therefore essential that all impediments in the way of a speedy promotion of public health are eliminated. The low consumption of Milk is one such and hence to increase its supply and its consumption

sufficient number of high yielding cows from foreign countries to meet the demand of the people. Moreover these foreign breeds of cattle could not easily acclimatise themselves to our country and they fall an easy prey to the several cattle diseases indigenous



Milking the cows.

to this country. The only way is to grade up our cattle with bulls of high milk yielding strains in the country itself, such as those of the Sindhi, Sahiwal and Tharparkar breeds. Buffaloes can be graded up with the murrah breed of bulls. In an Agricultural country, where bullocks supply the motive power breeding policies should be such that the requirements of production of work bullocks are not ignored. The policy of the Government is therefore to grade up animals in the country parts for production of work animals and to develop animals in semi-urban and urban areas for milk production. This grading up work is being undertaken in a planned manner through the distribution of bulls and more recently through Key Village Scheme.

A Key Village is an intensive cattle improvement unit working in a compact area of a group of contiguous villages containing a total population of about 500 to 750 cows or she buffaloes over three years of age fit for breeding or milk production. All scrub bulls are castrated and breeding is permitted only through the allotted bulls. In order to increase the usefulness of the superior bulls, Artificial Insemination technique is made use of. Four Key Village

units are attached to an Artificial Insemination Centre. The number of inseminations is increased from 10 to 15 through this technique. All cattle in the area are periodically protected against contagious disease. Breeders' societies are being formed to organize the supply of feed, and fodder on co-operative basis, and to undertake marketing of animals and animal products, to the maximum advantage of the producer. Milk recording is undertaken to watch the progress from generation to generation. It is the intention that in the Key Village areas more and more attention should be paid for the production of fodder and maintenance of pastures. There are 15 such Artificial Insemination Centres in this State, based upon which are 36 Key Villages functioning. Of these, the one at Cinchona on the Anamalai hills and those at Valarpuram and Kilacheri are for the production of milch strain of cattle. There are in addition 4 Artificial Insemination Centres functioning in the Cities of Madras, Coimbatore, Madurai and Tiruchirappalli (since transferred from Ootacamund). Three more centres are expected to be sanctioned for 1955–56 to be established in Salem, Erode and Kozhikode. Through these Key Villages and Artificial Insemination Centres so far 60,807 inseminations have been carried out and 6,637 superior calves have been verified. In the National Extension Service and Community Project areas 95 breeding or Artificial Insemination Centres have been started and 266 pedigree bulls have been supplied. Apart from this there are 1,108 breeding bulls, distributed to custodians under various schemes.

Salvage of Dry Cows : Madras City

While we are attempting to grade up the stock by all these means, a large number of good cows and buffaloes brought into the Madras City annually from the villages for purpose of the urban milk supply are unfortunately sold for slaughter when they go dry. As only the very best are brought into the City, this continuous process of premature destruction of cattle of breeding value involves a rapid depletion of potential cattle wealth in the State. In order to stop this wastage a scheme is now working in the City by which cows which are fit for breeding are sent to Kancha of Kambakkam Reserve Forest, Ponneri taluk, Chingleput district, where grazing facilities exist. A Co-operative Society at Madras has been

entrusted with the working of the scheme and a beginning has been made with cows kept by private persons, members of the Co-operative Milk Supply Societies and such of the milkmen desirous of joining the scheme. After quarantine for a week in the City, the cows are sent to the farm at Government cost, and maintained there till they calve or returned earlier at the request of the owners. A fee of Rs. 10 to Rs. 12 per cow is charged per month for maintenance. The animals are maintained at the risk of the owners

Left.—*The salvage farm at Kambakkam.* Right.- *Dry cows from Madras City are transported by motor vans to the salvage farm at Kambakkam.*

though all measures are taken for proper maintenance of their health and safety against wild animals. The farm admits about 250 cows annually and an equal number is returned. A Non-Official Committee visits the farm periodically and offers suggestions on the working of the Farm. There are four such salvage farms working in the Madras State, but there is scope for many more.

As indicated already, the superior strains of animals obtained by grading could not be expected to develop the higher productivity and maintain the same over successive generations unless they are given adequate quantities of feed and fodder. The Madurai Municipality has set up an example in this State as to how the City Sewage can be most profitably utilized for the production of cattle fodder. A proposal is also under the consideration of the State Government, to organize a milk colony at Erukanjeri in co-operation with the Corporation of Madras.

The example set up by the Municipality of Madurai should be followed by the other Municipalities of the State. Leading land owners must also set apart a portion of their irrigable land for production of fodder crops. Palatable and nutritious grasses could be established in coconut and mango gardens and where irrigation facilities are available guinea grass could be grown for repeated cutting in these gardens. It is my belief that every family which has got a small compound can keep a cow. About one cent of kitchen, garden irrigated through kitchen washings could support sufficient guinea grass for feeding a cow when used with other supplements.

Dairying and Milk Supply Co-operative Societies

By Sri A. B. Shetty,

Minister for Health and Co-operation, Government of Madras.

Milk is recognized universally as a most valuable article of food containing animal proteins, important mineral salts and vitamins which help to correct the existing deficiencies in diet. It is the chief item of food for all human beings throughout their lives. Dairying is one of the most widely practised subsidiary occupations of the agriculturists. The cattle population of India is considered the largest among all the other countries in the world. The per capita consumption of milk in India is 6·6 oz. per day whereas it ranges from 40 to 60 oz. in the advanced countries. It is regrettable to note that per capita consumption of milk in Madras is as low as 3·60 oz. per day. This is due to the poor production of milk in this country. Dairy industry as such has been unremunerative and under-developed. Ninety-five per cent of the milch cattle are in villages and are owned by ryots of limited means. The animals are often ill-fed, under-nourished, and improperly cared for. The milk yield is therefore low. The cost of milk has been high and the common man finds it difficult to buy the required quantity of milk to make good the deficiencies in his diet.

Co-operative Milk Supply Movement

With the increase of population in certain areas, there has been a great demand for good quality milk. Maintenance of milch cattle in towns is costly and professional milkmen have therefore, been charging exorbitant rates. The ryots in the villages who own

milch animals have been finding it difficult to transport the surplus milk in proper time for disposal. Consequently, middlemen trading in milk have come into existence and have been exploiting both the producers and consumers. It has, therefore, been found necessary that the dairy industry in the country should be organized effectively and efficiently to ensure a fair return to the producer for the milk produced by his animals and to provide an adequate supply of wholesome milk drawn under hygienic and sanitary conditions at a reasonable price to the consumer. Experience in foreign countries has shown that organization of milk on co-operative lines alone can satisfactorily solve the problem. In countries like Denmark, Sweden and Norway more than 90 per cent of the national output of milk is handled by co-operatives. Following these examples, milk co-operative was first started in the Madras State, in the outskirts of the Madras City in the year 1927 with a view to providing a subsidiary occupation to the agriculturists and supplying pure and wholesome milk to the consumers at a reasonable price. Later a society was formed for the milkmen in the Madras City. These co-operatives formed themselves into a Union known as the Madras Co-operative Milk Supply Union in the year 1928. For a considerable period, in the initial stages, it was problematic to successfully work these organizations. There was acute competition from the private milkmen. Disposal of surplus milk was difficult and the institutions had to incur heavy loss. Progress in the field of co-operative dairying in the State was slow for a period of more than ten years. On the 30th June 1937, there was only one Milk Supply Union and 20 Primary Societies in the Composite State. By the end of June 1940, however, there were 15 Unions and 88 Societies. In that year Government also appointed a Dairy Expert to advise co-operative milk supply institutions on technical matters and train their members and staff in the principles of dairy hygiene, etc.

Three-Year Plan

A comprehensive three-year plan for Dairy Development on co-operative basis was approved by Government in the year 1948. This plan envisaged (*a*) the organization of more milk supply societies and unions in areas not served by such institutions; (*b*) the strengthening of the existing milk supply societies and unions; (*c*) the supervision over the working of the milk

co-operatives and (*d*) the provision of technical advice and veterinary assistance. This plan was implemented with effect from 15th October 1948 when there were 335 milk supply societies and 26 unions with a total production of about 12,000 Madras measures per day. At the close of the first three years, i.e., 15th October 1951, there were 680 societies and 37 unions with a total daily production of more than 29,000 Madras measures per day. This plan of development was ordered to be continued for a further period of three years from 15th October 1951. The introduction of the three-year plan was a landmark in the annals of the Co-operative milk supply movement. By the end of September 1953, i.e., after a period of five years from the inception of this scheme, there were in all 41 unions and 725 societies in the composite Madras State as against 15 unions and 88 societies (about 13 years ago) on 30th June 1940. After the separation of the Andhra State there were 20 unions and 529 societies in Residuary State with a total production of about 37,000 Madras measures per day.

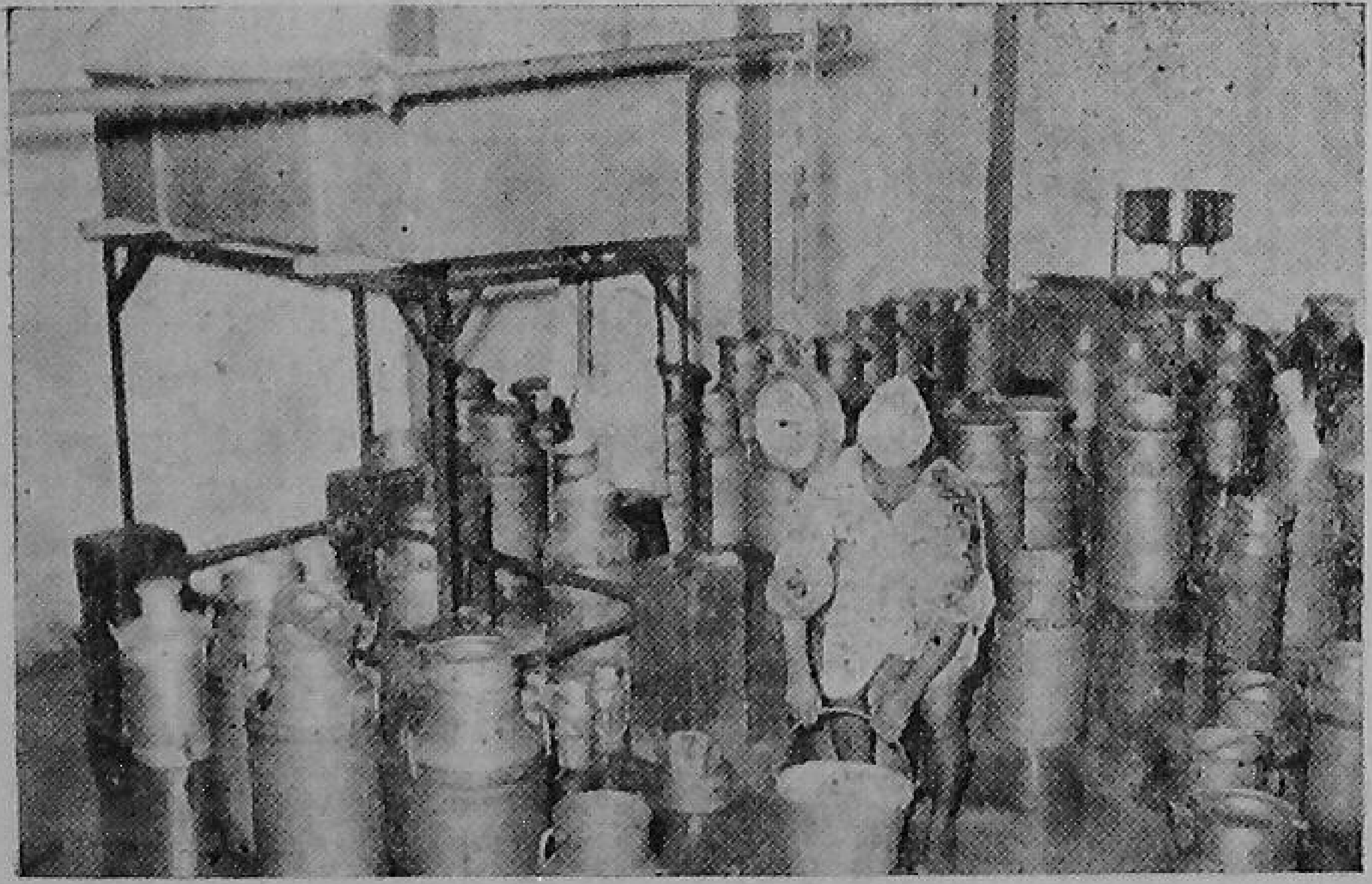
A Scheme for Madras City

The three-year plan referred to above was formulated for the districts excluding the Madras City for which a separate scheme was in operation. In the Madras City, during and after the war much difficulty was experienced to provide adequate supply of milk to the consumers. With a view to augmenting the supply of milk to the City through the Madras Co-operative Milk Supply Union, a scheme was sanctioned in 1945. In this scheme several facilities were afforded for increasing production. One part of the scheme aimed at procurement and disposal of milk on a larger scale with a view to increasing its supply to the public at Madras by an additional quantity of 5,000 lb. per day. Government gave the necessary staff free of cost for supervision and for work connected with quality control. A non-recurring expenditure of Rs. 1·11 lakhs and a recurring expenditure of Rs. 20,500 per annum were sanctioned, and an up-to-date laboratory with equipment to analyse and test the milk supplied by the Union has been established. As a result of these steps an additional production of 5,000 lb. per day was reached.

Veterinary Aid

With a view to providing prompt veterinary aid to the milch animals belonging to the members of the

Madras Co-operative Milk Supply Union and its affiliated societies, a special Veterinary Officer with necessary staff has been employed. He has been provided with a mobile veterinary unit. Six first aid posts have also been established in different centres with necessary technical staff to serve the urgent needs of the members. The scheme is of great help to the members of milk co-operatives to save their animals from various contagious diseases which generally prove fatal and also to secure precautionary measures such as, inoculation, etc., from cattle diseases. The Vterinary aids have proved quite successful and are much helpful to the villagers.



Weighing the milk by a milk co-operative society.

From Cow to the Consumer

As a result of the fillip given to the development of milk supply co-operatives in this State, in quite a number of places, the milk trade has been controlled by co-operative milk supply organizations, and these institutions have brought about an improvement both in the volume and in the ethics of the trade. The motto of the Milk Supply Co-operatives is to help their members to produce more milk to enable them to increase their income from dairying and at the same time provide consumers with good milk. To encourage their members to take active interest in dairying and to increase production, milk co-operatives give them loans for the purchase of milch animals out of the loans that are provided for them by Government and the Central Co-operative Banks and from their own

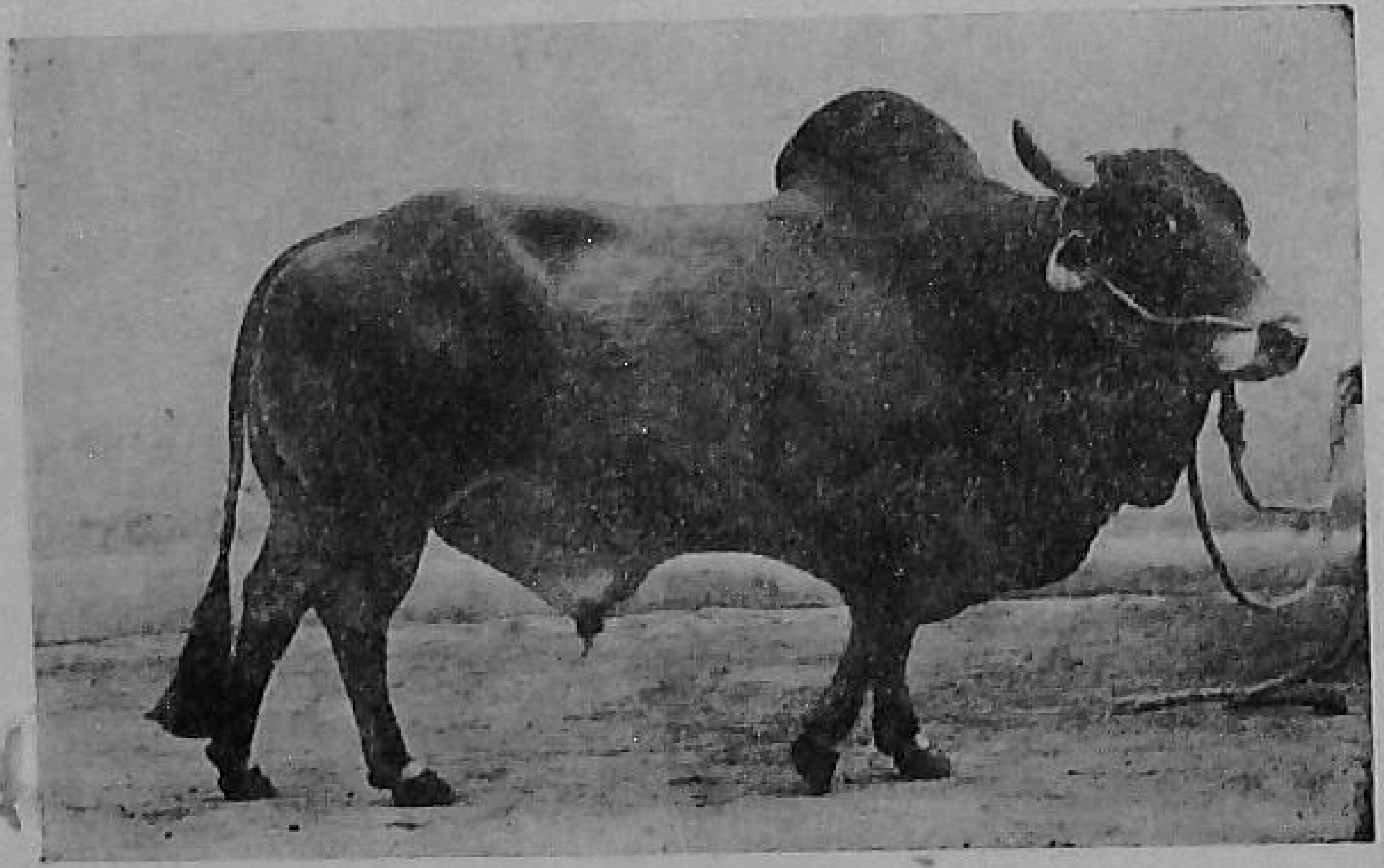
resources. The members bring their animals to a common milking yard and milking is done there under hygienic conditions under the supervision of the directors of the societies or the paid staff. Milk is filtered and put in sterilized cans, sealed and transported to the Headquarters of the affiliated unions or any other assembling centre from where distribution is made. The Unions and the societies which have to tap rural resources and pool them are given interest bearing loans by Government for purchase of trucks and lorries. The milk so collected is distributed to the consumers as quickly as possible so as to ensure timely supply of milk according to the convenience of the consumers. It is supplied in separate sealed cans to the upper and lower class people by the distribution boys and vendors. Coupon holding customers are supplied milk at their very houses and through depots opened in important centres. To ensure that the milk distributed is not adulterated, the Dairy Assistant employed in the City and in the districts under the three-year plan referred to above conduct frequent quality tests generally at three stages from " Cow to Consumer ", viz., at the milking centres, at the premises of the institutions and when the milk is on the way to the consumers. These co-operatives are also undertaking contracts for the supply of milk to Government Hospitals, Jails, Certified Schools, etc. Recognizing the fact that the milk supplied by co-operatives is generally better and dependable than that of the private contractors Government ordered that in respect of hospital supplies the rate offered by these institutions should be accepted even though their rate may be slightly higher than that of the private contractors. Some of the milk co-operatives find it difficult to dispose of the entire production of milk in liquid form during the surplus months and incur loss on account of conversion into curd, buttermilk, etc. They are now being helped by the Dairy Assistants of the Districts to convert surplus into profitable by-products like Khova, icecream and for this purpose many of them have equipped themselves with icecream freezers. The Madras Co-operative Milk Supply Union is having cold storage and pasteurization plant where milk is processed and then sold to customers. This help is to increase the keeping quality of milk.

With a view to introducing a better system of feeding on scientific lines, attempts are being made by these co-operatives to popularize computed cattle feeds. They

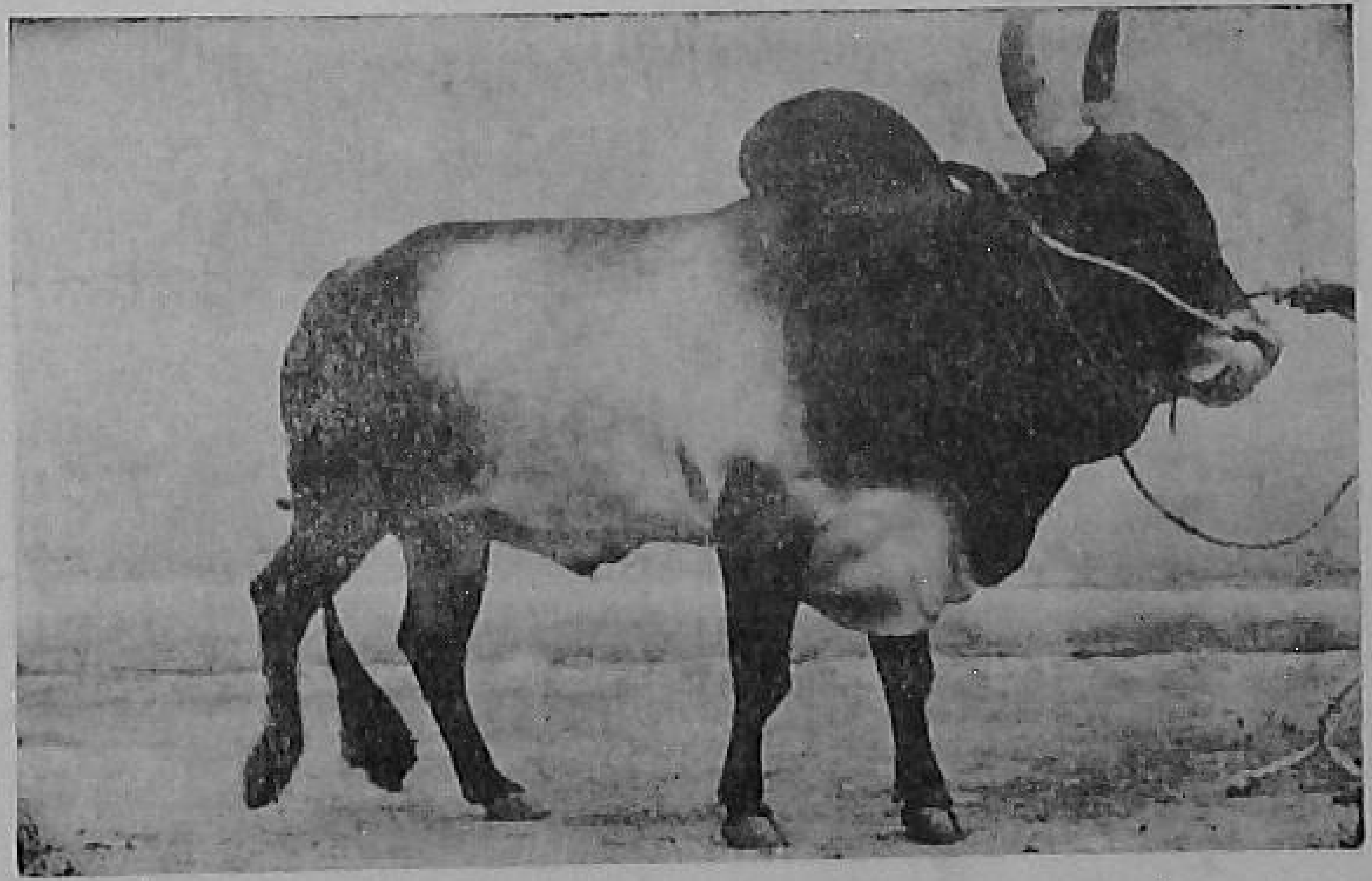
Dairy Assistants choose the ingredients that will suit the animals in each area with reference to local conditions and the co-operatives manufacture them under their supervision. They also distribute to the members cattle feed like groundnut cakes, oil cakes, etc.

Selective Breeding

The milk co-operatives also take steps to improve the cattle strain of the members. Many of them maintain pure breed and approved bulls to promote selective breeding. Government meet half the cost of the bulls in such cases and the other half is borne by the institutions concerned. Government have also ordered the stationing of stud bulls at some of the Government Veterinary Hospitals in order to improve the livestock belonging to the milk co-operatives. These bulls give free services to the milch animals owned by the members of the milk co-operatives. Even non-members are allowed to avail of the facility on payment of service fees.

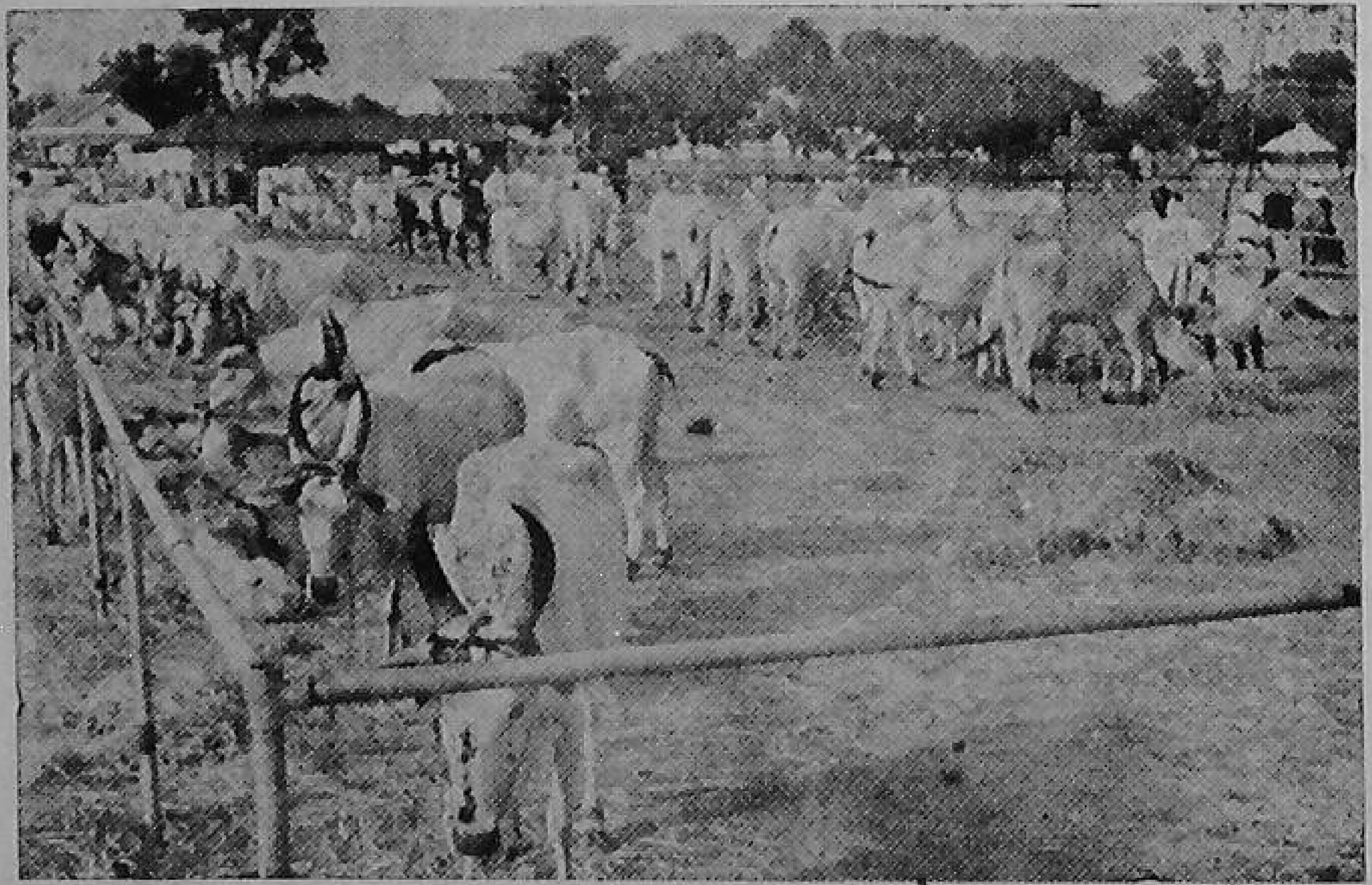


Sindhi bull (left) *and Kangayam bull* (right).

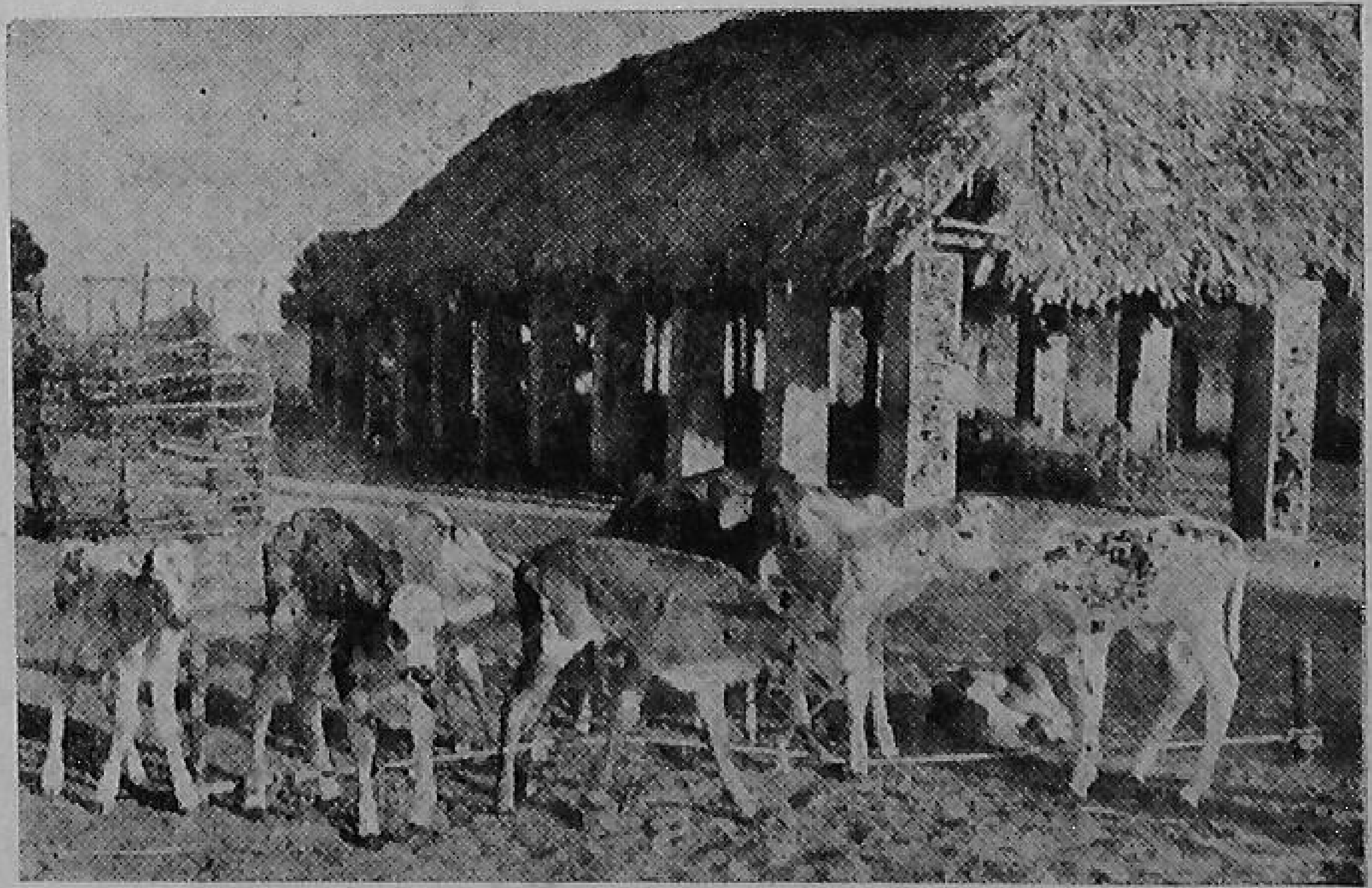


Salvaging

There has been a heavy loss of cattle wealth through lack of effort to provide facilities for salvaging milch animals when they become dry. The milkmen especially in cities and towns consider that a dry animal is a drag on his resources, because he is not generally in a position to maintain it. It is often the case that good animals when they go dry are sold to butchers for slaughter. To avert this tremendous loss of cattle wealth, the Madras Co-operative Milk Supply Union is running a salvage farm at Vattambedu in Nellore district. The animals of the members of the



Kangayam cows in the enclosure at a cattle show.



Calves born at the salvage farm, Kambakkam.

milk co-operatives affiliated to the Union are maintained in the farm during the dry period and are returned to the owners just when they are about to calve. Pedigree bulls are maintained in the farm for rendering service to dry animals. Necessary supervisory and technical staff to look after this scheme is provided by Government. The Calicut Co-operative Milk Supply Union is running another such salvage scheme on a small scale at the Chatamangalam Farm. Investigations are being made for starting salvage farms with a view to affording facilities to owners of milch animals in urban and suburban areas.

Government have sanctioned a scheme for providing salvage facilities to cows owned by the citizens of Madras. The scheme provides for the reception of dry cows and their maintenance in the Kambakkam Reserve Forest within the reach of the Madras City and where there is plenty of cattle fodder and pasture land. The dry animals are maintained until they calve and are returned to the owners. The scheme is worked by the Madras Co-operative Society for salvage of dry cows. Government meet the cost of the supervisory staff employed under the scheme.

Progress of Milk Co-operatives

The progress recorded by the milk co-operatives is briefly as follows :—On 30th June 1954, there were 30 milk supply unions and 560 milk supply societies of which 345 societies served as feeder societies to the unions. The remaining 215 societies distributed milk collected by them from their members. Thirty unions had on their rolls 8,105 members with a paid-up share capital of Rs. 5·19 lakhs. The milk supply societies had a total membership of 65,101 and paid up share capital of Rs. 9·73 lakhs. The unions handled milk to the tune of Rs. 71·07 lakhs and the societies to the tune of Rs. 69·34 lakhs during the year 1953–54. The Madras Milk Supply Union which has 150 feeder societies and 23 individuals as members is the biggest milk co-operative which handles the largest quantity of milk. Its paid up capital was Rs. 1·73 lakhs. It supplied the entire quantity of milk required for all Government hospitals in the Madras City and the Government Tuberculosis Hospital at Tambaram. The value of milk sold during the year 1953–54 amounted to Rs. 31·78 lakhs and its daily production of milk Rs. 29,000 lb. or 7,250 Madras measures. About a

fifth of the milk requirements of the inhabitants of the Madras City is now being supplied by the Union and efforts are being continued to augment this supply to the maximum extent possible.

Milk co-operatives have come to stay to exercise an effective control over the milk production and distribution in this State, bringing about a marked improvement both in the quantity and in the quality of milk made available to the public. These co-operatives are essentially producer's organizations and help the agriculturists to take dairying as a profitable subsidiary industry in addition to their agricultural occupation. In fact many of the agriculturists have not only improved their cattle wealth by joining these institutions but have been also able to obtain a decent earning.

Need for More Milk

By DR. V. R. RAJAGOPALAN,

Director of Animal Husbandry, Madras.

It is a well-known fact that our country is lacking in the supply and demand of milk. When the country is undergoing a change in the promotion of rural welfare, it is but essential that the low production and consumption of milk in the rural parts should necessarily be activated especially when the rural milk supply is very defective. In order to achieve this object and to rouse the milk consciousness of the public in this State, a '*more milk day*' has been organized throughout the State just at the opportune moment when the country demands production of more milk for the welfare of the people.

From time immemorial, milk is considered to be an indispensable item in the Indian diet. Our forefathers realized the nutritive value of milk and endowed milch animals to Sages and Rishis. Milch animals are held in reverence in Hindu houses.

The scientists of modern times have recommended milk as a well-balanced diet whose ingredients are easily digestible and assimilable.

Cow's milk is a very valuable food as it contains all the essential constituents, viz., proteins, carbohydrates, fats and vitamins in addition to mineral matter. Milk is one of the few foods consumed both by human-beings and young animals in its natural state. The proteins are essential for the formation of

muscle, the minerals consisting of lime and phosphorous are essential constituents of bone, carbohydrates present in the form of milk sugar or lactose and the butter fat of milk are energy producing substances and lastly the 'Vitamins' are essential for resistance to diseases and for normal development particularly of the young. Not only is milk the most important food during early childhood, but also is in one form or the other, an important item in our normal diet throughout life. In sickness, especially it is the one food most often called upon to sustain and nourish the body as it is easily digestible.

The average Indian diet has a predominance of cereals in its ration. Hence milk will form the best suitable supplement to such a vegetarian diet and supply 'protective' foods of high nutritive value. Therefore, milk should become a regular article of our diet and is to be consumed in adequate quantities.

Our 'per capita' consumption is far below the minimum nutritional requirements in spite of India possessing about one-third of the world's cattle wealth. Our average consumption works out to only 5½ oz. per day including both fluid milk and milk products whereas, in the Western countries, the same comes to nearly :—

56·8 oz. in Canada,
44·4 oz. in Australia,
40·7 oz. in Great Britain and
35·6 oz. in United States of America.

It will take decades for us to reach the Western standards in the above, but our immediate aim should be to see that every child gets at last ½ lb. of milk daily. Hence the Nation can make no better investment than in milk for its children, since they are the future citizens of our country.

More Milk Production

The importance of the milking capacity of Indian cows has been recognized as the most important need of the dairy industry in our country.

Though most of our cows are considered to be of poor milk strain, it is possible to improve their production by proper selection, scientific breeding, judicious feeding, proper management and effective disease control.

(*a*) *Feeding*.—Our cattle, in general, are underfed. There is deficiency of every kind of feed and fodder to meet all the requirements of our stock. Steps should be taken to conserve all the available fodder in the form of hay, silage, etc., in seasons of plenty in order to tide over periods of scarcity.

Milking animals should be fed as per requirements depending upon their age, weight, milk production, etc., with well-balanced rations. Good grazing and green fodder supply especially the Legumes will go a long way in increasing milk production. Care in feeding begins from the period of pregnancy, to calving, and continues further up to the growth of the newborn calf into either a mature bull or heifer to effect real and substantial improvement of our stock and does not mean caring for the cow only when it yields milk.

(*b*) *Breeding*.—The majority of our cattle today are of a non-descript nature. Their improvement by grading up to the level of those of recognized breeds which are known to possess the desired qualities is the next step. This involves a controlled scientific breeding policy to be adopted taking every area of tract into consideration.

It has been recognized that to maintain a high-yielding herd, bulls used should have a good milk strain and good pedigree records, with chances for frequent introduction of fresh blood.

(*c*) *Care and management*.—All aspects concerned in maintaining livestock should be carefully planned keeping in view the latest scientific development in every field, and adopting those which will help in developing the stock.

Care of Milch Cows.—Man and cow have become by long association at least a composite animal. One cannot do without the other. Our immediate concern in India is to see that the importance of the cow as the mother of the bullock, yielder of milk, and as a producer of manure is maintained or preserved.

There has been an increase of human population and decrease in pasture. The number of milch and draught animals has remained the same for the last 25 years. The average life of the cow in India has been estimated at 5 to 6 years only. The deterioration of our stock has gone too far for want of proper nutrition, breeding, maintenance and veterinary aid. Calves should be reared well. Better feeding with

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nutritious feeds make them grow quickly, and in course of time, the heifer calves mature early, the bulls attain good size and become regular breeders. Heifers may be served when they attain two-third their adult weight. Pregnant cows should be fed with extra rations. Massaging the udder daily is beneficial. Enough grazing, exercising and grooming should be given to cows. Kindness and constant handling return immense benefit.

Except at milking hours, it is preferable not to tie cows at all. The cows and calves may be kept in separate groups in shelters or yards with enough space to freely move about. Good housing should be provided. The urine and dung should be utilised. Water troughs are necessary in every yard to provide enough water at all times.

Individual feeding is helpful. Proper hygienic precautions should be taken to keep everything clean to keep off mosquitoes, flies and fleas. Insecticides may be used against lice and ticks. The hoofs and horns are to be kept clean, if necessary by trimming.

Regularity should be strictly observed in all matters in attending to the cow.

A careful watch should be kept on the health and weights should be recorded at regular intervals. A minimum period of two months should be given as rest to the productive and reproductive organs, i.e., the cows should be given a dry period sufficient to recoup and be in condition for the subsequent lactation. Secondly after calving, cows could be taken to the bull after an interval of two months.

(*d*) *Disease control.*—The prompt and widespread application of the knowledge which Veterinary Research has already made available would save the country from the ravages of many pestilent diseases and thus prevent enormous loss. Equally important as the need for further research, is the need for producing more trained personnel whereby appropriate measures may be applied at the right moment and before, rather than after any disease gets established and flares up now and then.

Feeding of Cows

It has been proved that village cows, when brought to Government farms, on an average, yield 60 per cent more milk in their subsequent lactations.

The first progeny of these cows show a further improvement of 10 to 15 per cent in their milk yield over and above the increase recorded by their dams. This observation has opened a new chapter in our national economy since by feeding better, improved breeding and management a substantial increase could be obtained in milk production.

Animals are fed in order to maintain all the vital life processes such as energy to walk about, replacement of body tissues, and heat which is required in the body. This portion of the ration is termed maintenance or subsistence ration. In addition food is necessary for being economically converted into such products as milk, work, meat, foetus growth in pregnancy, etc. This part of additional ration is termed *production ration.*

Hence in computing a well balanced ration for an animal, the above factors should be taken into consideration along with the following points :—

(1) Food-stuffs available in the locality and their cost.

(2) Variety of feed to be chosen to make a ration palatable, and provide all nutrients required in their proper proportion.

(3) Any change in diet should be gradual.

(4) Rations must be clean and wholesome.

(5) Feeds should be properly prepared in order to be rendered easily digestible and utilised to the maximum, for example, crushing or grinding of hard grains such as oats, and horsegram.

(6) There should be enough bulk to give a sense of repletion.

(7) Food should be always palatable.

(8) Any feed should be laxative in nature.

(9) Green fodder, preferably partly of legumes such as berseem or lucerne, is essential.

(10) A good pasture for the grazing of animals.

Rations are to be fed at regular intervals at proper timing in equal proportions for the cows to get sufficient rest and quietitude for chewing the cud. Clean and good water-supply is essential so that the same will be available for animals at all times.

A cow in milk should be fed according to the amount of milk it produces, in addition to what it needs for maintenance of life.

All dry cows used for dairy or breeding purposes should be given a little concentrate food as part of the maintenance ration which may consist of

(*a*) Concentrate mixture ..	1 Groundnut cake	1 lb.
	2 Cotton seed	½ lb.
	3 Wheat bran	1 lb.
	4 Bengal-gram husk	1 lb.
	5 Salt	2 oz.
	6 Mineral mixture	1 oz.
(*b*) Roughage	Green grass 45 to 60 lb. or straw or hay 15 lb.	

For every 3 lb. of milk produced, the cow should receive over and above the above ration 1 lb. of concentrate mixture.

All milking cows must get at least 10 to 15 lb. of green grass a day in addition to about 15 lb. of hay or straw. Cows in calf should be fed a little better ration in addition to the maintenance portion specially 2 to 3 months before calving in order to produce a better calf and increase the flush of milk at the time of calving. About 5 lb. of the above concentrate mixture is considered necessary.

Calf Feeding

Of course, the calf cannot be neglected as she is the future cow. It is essential that a calf should have a good start from its birth. The rate at which a calf grows and the mature size it may attain, depend upon its inheritance, health and nutrition. Liberal feeding with suitable ration, on the other hand, will accelerate the rate of growth which will make the animal reach the breeding age and mature size a little earlier than usual.

Rations—

1 One month old calf.	6 lb. milk.
2 From 2 months up to 4 months.	8 lb. of milk plus ¼ lb. gruel plus 1 lb. concentrate mixture (no cotton seed included) and a little greens and hay (4 lb.) (2 lb.)
3 From 4 upto 6 months.	6 lb. milk, 1 lb. gruel, 1¼ lb. concentrates plus 6 lb. green and 2 lb. hay.
6–10 months	4 lb. milk, 1 lb. gruel, 2 lb. concentrates plus 8 lb. greens and 3 lb. h ay

(Gruel—This may be made up of skim milk, ragi flour and linseed meal in the proportion of 10 : 1 : 1, boiled, cooled, 1 oz. salt added ana fed to calves sufficiently warm.)

Milk Products

Nearly 64 per cent of the quantity of milk produced in India is converted into milk products and utilised, and the rest of 1740·96 lakh maunds of milk are consumed in fluid milk.

The rural producer of milk has no other alternative but to convert the surplus milk into a form of dairy produce which will stand storage and transport under tropical conditions to distant markets for sale. In view of the fact that dairying is not a major occupation of the Indian Agriculturists, it has never been possible for him to think in terms of investing heavy capital outlay for the purpose of equipment that would be necessary for converting large quantities of surplus milk into products similar to those marketed in other well developed countries.

Hence the traditional methods of making butter, ghee and other products of milk continue even till to-day.

1. *Desi butter.*—This refers to butter isolated from curdled milk employing indigenous churning devices. Small scale production of milk in scattered households of rural areas, has left no other choice for the economic exploitation of surplus milk except for butter-making.

Agitation of curdled whole milk with corrugated wooden beater attached to the ends of the wooden pole in an alternating rotatory motion is done by pulling the ends of the cord wrapped round the pole. This is done in the cool early morning hours with addition of varying quantities of pot water to the curd at different stages of churning. The butter fat which floats at the top layer of Buttermilk is the by-product. Since the quantity of butter made is small, the same is stored for a considerable period in order to accumulate enough quantity for its economic conversion into ghee.

2. *Ghee.*—Butter is heated over iron-pans over direct flame until a stage is reached when all moisture escapes and curd particles settle down. The complete removal of moisture is indicated by the absence of the "crockling" noise caused by the escape of steam through heated oil.

Ghee is stored in tins till sale, and may be kept for long without spoilage.

The Government of India have set up a separate organisation called the Agricultural Marketing Board which has fixed up standards for the quality of ghee and for ghee that maintains that standard, a certificate of authorisation is given to have the " Ag. Mark " seal as a guarantee to the consumer as to the purity of the product he purchases.

Khoa.—Milk is taken in an iron-pan over gentle flame. A long ladle or spoon (karandi) is used to stir the milk uniformly and continuously till three-fourth of the water evaporates.

Khoa is the milk produce obtained by rapid and continuous evaporation of moisture from whole milk in an open pan placed over a fire till the milk solids have increased to 75 to 80 per cent.

Salvage of Dry Cattle in Madras State

By Sri A. PALANIAPPA MUDALIAR, M.A.,
Registrar of Co-operative Societies, Madras.

The term " salvage " is commonly used in India for the preservation of a cow or a buffaloe during her dry period till she calves. Ordinarily the dry period of milch animals ranges from 3 to 15 months. Most of the cities in this country have no milk pockets surrounding them and there is therefore no possibility of large-scale production of milk in areas very close to the cities. This has necessitated the maintenance of milch cattle inside the cities.

As the population of a city grows the number of milch cattle correspondingly increases to cope with the demand for milk. This system of keeping cattle inside the cities has serious defects, the chief among them being the drain it causes on the cattle wealth of the country. The milch animals which are brought to the city seldom return to the rural areas as they are slaughtered or rendered unfit for further breeding and its progeny also is got rid of at the earliest possible time. Milch animals have therefore to be imported into the cities, to replace the animals that go dry. This drain which has been continuing for a long time past has depleted the country of its good breeds and some of the important breeds are affected to the point of extinction.

The cream of stock in most of the rural areas and breeding centres is generally imported into the city, because, the milkmen go in for these quality animals which they can profitably maintain and earn

a living under the expensive urban conditions. So far as the Madras City is concerned about 15,000 to 16,000 cattle are imported annually from the breeding tracts of Ongole and Cuddapah. Out of these only 3,000 to 4,000 animals are sent back to the breeding tracts by rail for preservation. Some of them are marched on foot to the adjoining rural areas; but still a large number of animals that go dry are sold to dealers and brokers who finally pass them on for slaughter. According to the report of the Salvage Committee on the slaughter of animals fifty per cent of the animals slaughtered are worthy of preservation.

The milch animals in the cities are generally kept in insanitary and congested stalls which are not conducive to the production of clean and wholesome milk. The urine and the manure dung remain lying around the stalls producing foul smell and form an excellent media for breeding of flies. This affects the health of the people living in the vicinity. Besides, the cattle have no room for exercise much less grazing grounds or other facilities and the calves have no place in the general management.

It is a common feature that a large number of freshly calved animals are imported to the towns and cities every year from breeding tracts and after one or two lactations they are rendered unfit for further use. The worst of it is that calves are neglected and many die soon after their arrival in the cities. Under these conditions it is no wonder that production of wholesome milk is neither plentiful nor cheap. It is obvious that from all points of view there is the dire need for planned preservation of cattle wealth in the country.

Kambakkam Salvage Farm

The need for the salvage of dry cattle of the Madras City was realised by the Government and the owners of milch animals in the city as it was observed that there was a gradual depletion of valuable milch animals in the city due to the difficulties experienced in maintaining them during their dry periods. To prevent this continuous wastage of cattle wealth a scheme for the salvage of dry crows was launched by Government in the year 1944. The scheme is worked by the Animal Husbandry Department through the Madras Co-operative Society for

salvage of dry cows started for the purpose. The scheme provides for the reception of dry cows and their maintenance in the Kambakkam Reserve Forest where there is plenty of pasture. The dry animals are maintained until they calve and are returned to the owners. A nominal fee of Rs. 10 per animal per month is collected from the owners. As the fees collected from the owners of animals are not much, the major portion of running the farm by the Animal Husbandry Department is subsidized by Government. On an average, about 200 to 250 animals are admitted to the farm every year. Two thousand two hundred and three animals have so far been admitted into the farm for salvaging them.

Vattambedu Salvage Farm

In the year 1950, another scheme for salvage of dry she-buffaloes was put into operation, under which dry animals in the City are collected by the Madras Co-operative Milk Supply Union and sent to the Salvage Farm at Vattambedu in Nellore district. This farm is run by the Madras Co-operative Milk Supply Union with financial assistance from Government by way of free services of the Supervisory staff consisting of one Senior Inspector of Co-operative Societies, one Stockman compounder and one attendant and a cash grant of Rs. 460 per annum towards the maintenance cost of stud bull and medicines. A monthly fee of Rs. 8 for each country buffaloe is charged by the Union. On an average, about 100 animals are admitted every year. So far about 800 animals are admitted from the inception of the scheme. The Union has invested about Rs. 60,000 for establishing the farm and reclaiming waste lands for growing fodder crops. The farm has now under plough, 40 acres under wet and 20 acres under dry cultivation.

Though the facilities made available by the Government and their benefits have been well realised by the public, yet the admissions have not been appreciable. The two schemes appear to have not even touched the fringe of the problem considering the population of milch cattle in the city. An examination of the statistics of the animals salvaged in these two schemes show that only middle class and well-placed owners avail themselves of the benefits of the scheme. The bulk of the professional milkmen owning thousands of milch cattle in the city have not availed of the benefits.

The chief causes for the poor response are said to be due to (1) the low economic level of the people engaged in the trade; none of them can afford to wait for 10 months for a salvaged animal to return and at the same time meet the salvage costs at Rs. 8 to Rs. 10 per month; (2) When an animal goes dry the milkman has to lose his customer. He is therefore faced with either losing his customer or to find means to immediately replace his dry animal with one in milk. The cattle traders in the City exploit the weakness of the milkmen. The middleman trader takes the dry animal at a low price and replaces it with a lactating animal at a higher price. Only an advance of half the value of the animal is received from the buyer and the balance is allowed to be paid in monthly or weekly instalments. The milkman is therefore exploited at both ends. But he prefers this proqedure as it readily solves his problem of running his milk trade.

To tide over the difficulty of the members from paying the salvage fees monthly and to give at least a temporary financial relief the department permitted the Union to treat the salvage fees as a loan and recover the same in easy instalments when the animal comes to milk; even this concession has not found much response. It is therefore necessary to see that in the interests of the perservation of cattle wealth of the country the salvage scheme is made cheap and attractive by organizing several such farms.

Other Schemes

A drive has been instituted to organize several salvage farms on co-operative basis on the outskirts of big town and cities throughout the State. The Deputy Registrars of Co-operative Societies have been asked to investigate the possibilities of starting salvage farms in suitable places. Proposals for starting salvage farms in the following places are under consideration and investigations to start farms in other places are in progress:—

(1) *Thuvakudi (Tiruchirappalli district)*.—It is proposed to take over an area of 100 acres for salvaging 50 dry cattle. The farm will be run by the Tiruchirappalli-Srirangam Co-operative Milk Supply Union. The capital cost of the establishment of the farm is estimated at Rs. 11,250. The scheme has been considered at the meeting of the State Livestock Improvement Board held on 2nd February 1955.

(2) *Karkal (South Kanara district).*—It is proposed to organize a Cattle Breeding Society at Karkal for salvaging the dry cattle in South Kanara district. An extent of 500 acres of Government poromboke land near Karkal town will be taken over for running the scheme. The scheme envisages the salvage of about 300 animals. As the site is near a reserve forest the animals will have adequate grazing facilities. The capital cost of the scheme is estimated at Rs. 20,000 and the recurring cost at Rs. 8,000.

(3) *Karaikudi (Ramnathapuram district).*—There is a proposal by the Karaikudi Co-operative Milk Supply Society to run a farm for salvage of about 300 to 400 animals by taking over an area of 612 acres of Government lands in Sencheri village, south of Karaikudi town. The capital cost is esitmated at Rs. 1·05 lakhs. This scheme could not however be pushed through as the District Agricultural Officer is of the view that availability of underground water resources should be ascertained in order to secure adequate water-supply from a well to be sunk under the scheme. This matter is now being examined by the Assistant Director of Industries, Ramanathapuram.

(4) *Abisekapatty and Pillaiyarkadu (Tirunelveli district).*—The Tirunelveli Co-operative Milk Supply Society has proposed to take on long lease an extent of about 800 acres of lands in the above two villages belonging to Swami Nallaiyappan and Kanthimathiammal Devasthanam. The terms of the lease are under correspondence between the Registrar of Co-operative Societies and the Commissioner, Hindu Religious Endowments. If the lands are secured on lease a farm for the salvage of about 100 dry animals at an estimated capital cost about Rs. 18,000 can be established.

(5) *Mannur and Nagalapuram (Chingleput district).*—Proposals of the Madras Milk Supply Union for running two more salvage farms in the above two places are under active consideration. The sites will be inspected by the Registrar of Co-operative Societies shortly and the proposals will be finalised.

It is hoped that a good number of salvage schemes can be put into operation in the coming years. It is hoped that these co-operatives will to some extent solve the problem of preservation and improvement of the cattle wealth in the Madras State.

More Milk from your Cow

By Dr. I. D. Mantramurthi

Cow is a very sensitive animal. It responds quickly to environmental conditions. Cow must therefore have least excitement, the same place and an attendant to attend on always. Kind treatment and loving care and in fact, anything that will keep the temperament of the cow at its very best will help the cow to produce its best. Do not therefore neglect the cows. Your cow is the most useful animal on your farm, it produces your work animals, yields, milk and will work, provided it is well fed and trained.

Daily hygiene and day-to-day care such as regular grooming, washing, exercise, bedding, handling of udders, befriending, free ventilation, sanitary housing, etc., may help the cow to produce more.

Dairy cattle require not only a comfortable place but also a quiet place, free from disturbances and fear. They require free ventilation and plenty of space to move about. The place should be free from dampness and very hygienic. In summer cows should be kept out day and night except when brought in for grooming and milking.

Separate accommodation is necessary for cows in milk, dry cows, pregnant cows, suckling calves and weaned calves.

Feeding

Do not maintain your cow in a poor condition; it should not be neglected but should receive attention and care. A heifer poorly fed will not attain maturity

quickly, she will breed irregularly, yield very little milk and will produce possibly five calves during her lifetime instead of seven or eight. She is liable to contract diseases more readily and will be unable to survive them, whereas if kept in good condition she would most probably withstand them.

Process of silage making.

A well-fed heifer will attain maturity quickly and will calve down at the age of three to three-and-a-half years instead of at the age of four to five years, her dry period will be reduced and she will yield more milk and will throw a stronger and healthier calf.

Do not try to maintain too many cows and heifers if you cannot produce enough fodder to feed them properly. If you do, they are sure to be in a poor condition. Reduce the number of cows, so that you can feed them better. Cows and heifers require good fodder just as much as your work cattle, as they are the producers of your bullocks. Discard your small puny cows, keep a small number of good strong healthy cows of average size.

Cows in a very poor condition come to heat after monsoon; this is because they have been able to get green grass and have put on some flesh; if you feed them on better rations throughout the year, they would come to heat more quickly than they do at present.

Best Way of Feeding

Judicious feeding will certainly increase the milk yield by nearly 50 per cent. Mere supply of

green grass with adequate proportion of legumes with good facility for grazing on well maintained pasture land will be the best and most economical way of feeding milch cows. If a cow is to produce its maximum quantity of milk or produce a healthy calf, it should be given extra food according to the amount of milk she can produce or the stage of pregnancy.

It is very important that dairy cows are judiciously fed to meet their requirements, usually based on their body weight, milk yield and the butter fat percentage. Lesser the feed greater will be the drain from the system; more the feed the greater the wastage.

Rations for dairy cows should depend upon the amount of milk secreted.

A dairy cow requires a very liberal supply of water (3–4 times the milk yield). The only safe rule is to provide a constant water-supply from which each cow may drink as much as she requires.

Usually succulent and laxative feeds are given to dairy cattle. Bran mash, cakes, green fodder, etc., are very good. Feeding on such poor roughages as straw is to be discouraged. Some hay particularly legume hay is good because of its high protein and ash content.

Concentrate mixtures containing bran, cake, dhall, husk, cotton seed, lime, bonemeal, salt, etc., are given in two equal quantities both morning and evening, at least half an hour before milking. The concentrate mixture should consist of several food stuffs all of which are palatable, so that the essential amino acids lacking in one may be supplied by another. At first indication of a lack of appetite, the ration should be cut down until the animal is in a condition to ruminate and assimilate well. Even if there is the slightest indication of a disorder, a purgative such mg. sulph should be given at once.

The ration for a heavy milch cow must be rich in proteins and minerals, the cheapest source of which are leguminous, clover, alfalfa, cowpea, sunhemp, etc. Alfalfa is rich in calcium and fairly so in proteins.

All animals require salt, especially those that eat large quantities of vegetable food. 1–2 oz. ordinary salt mav be added to the daily ration. Similarly

lime and bonemeal or churn flour. A cow requires 8–12 gallons of water for drinking and if in milk, four times the milk yielded.

Dry Cows

There should not be too many dry cows in a dairy herd. Anything less than 30 per cent is good and 25 per cent or less is very good, i.e., to say in any dairy stock 75 per cent of the cows should always be in milk under proper care and management.

A dairyman or ryot who owns a herd of cows and supplies milk all the year round to his customers has to regulate the calving of his cows throughout the year to fulfil his orders and keep up a uniform supply. It is therefore important that he should know something about the " Oestrum " in cows or " the period of heat ". This is the time when the cow calls for the bull.

A heifer will come on " heat " for the first time any time from the age of 2 to 4 years according to the state of her maturity, condition, environment and feeding, i.e., an early matured heifer reared under good conditions will take the bull much earlier than one which is underfed and undersized.

In temperate climates, cows come on heat about 3 weeks after calving and every 3 weeks after that until they conceive; but in India, the indigenous cows vary from 3 weeks to a year or more after calving and their periods are very irregular. On the average the Indian cow in good condition will conceive about three to four months after calving. Some people are under the impression that a cow will conceive at any time if covered by the bull. This is not so, a cow must be properly " on heat " if she is to conceive. It is therefore waste of time taking her to the bull unless she shows the signs of " Oestrum ".

A dairy cow should have a dry period of at least 6–8 weeks before calving. For drying up, reduce ration gradually if the cow continues to give milk. Milk her only on alternate days. In persistent cases, purgatives may be given. External application of Extract belladonna may sometimes be resorted to.

Pregnant Cows

Pregnant cows require special care and management. The milk yield of a cow throughout her entire lactation period may also be influenced by her condition of flesh

at calving time. A high producer will yield fully 20 per cent more during the year, if in good condition at calving time.

All mammals naturally have a tendency to put on flesh just before the young is born. The extra concentrates, fed to a cow, during her dry period, serves to strengthen the growing calf without draining the mother and at the same time, helps to store up fat in the body, for the purposes of milk production in the next lactation. Such pregnant cows are usually separated just six weeks prior to expected date of calving and personally fed and cared for as Nearing Pasturition cows. They are not sent out with the herd for grazing. Prenatal treatment, such as massaging of udders is resorted to during this period, by keeping her in a well ventilated sanitary byre. Exercise is also given by providing an open yard for it, to freely move about.

As the time of calving approaches, the cow should have a laxative diet. If on good pasture, no special attention is considered necessary.

All dairy cows should have exercise and nothing is better than freedom in a smooth levelled pasture or in a protected cattle yard. Cows must be brought up to full ration carefully after calving, using about three weeks for the purpose. Exercising of pregnant stock should be done under personal supervision.

Careful Milking

Milking should be done at regular intervals and intervals between milkings must be as equal as possible. The longer the interval the greater the amount of milk but poorer the quality in butter fat. Milking must be done by efficient milkmen and as quickly as possible with open thumbs to empty the udder completely without injuring the teats. The milking time should be about 4 or 5 minutes, as this is the time ordinarily taken by a calf to empty the udder. The last strippings are richest in butter fat. It is good practice to receive the first few strippings of such cows into a separate wide-mouthed cup containing a black piece of cloth not only to detect disease of udder but also to reduce the bacterial content of milk. Any cow having udder trouble must be milked last and this milk should not be mixed with others. Full-hand milking without jerks is the only correct way of milking except when stripping is done.

It should be seen that no odours, such as those of silage, onions, urine, etc., or dust is present in the milking shed, at the time of milking. It is advisable to have separate byres for milking and housing. It is better not to feed food imparting smell shortly before milking. The sides and flanks of a cow must be well groomed. Sometimes before milking, the udder is wiped with a damp cloth, though it has its own disadvantages and advantages. Cows are always milked on one side. In India, it is done on the left side.

Dairy cows are usually milked twice a day but in some dairies three times is the rule. Heavy yielders are usually milked thrice. While commencing to milk the first or fore milk should be discarded.

Milking must be carried out quietly, speedily and efficiently. To alarm or frighten the cow is to reduce the yield and perhaps make her permanently nervous of being milked.

Sometimes both forequarters are milked first and then both hind; or diagonal quarters may be milked at the same time, but there should be no pulling or tugging action on the teats during the process of milking. In some byres as a rule, cows are always milked from the right side but sometimes from the left. The udder should be washed with soap water or a mild antiseptic and rinsed before milking. No drops should be allowed to remain on the ends of the teats. After each cow is milked, the milk should be removed from the cow-shed at once and cooled to as low a temperature as possible. Milkers must be taught in terms of cleanliness.

There are special milk cans in the market with narrow bent mouths, to prevent dust particles falling directly into the can. To clean milking vessels, first clean with cold water and washing soda, then with hot water and then steamed and inverted.

Calves are permitted to suckle the cows or fed with at least 68 lb. of milk per day (i.e., 1/6th to 1/10th of their body weight) in most of the breeding farms, but in commercial dairies calves are usually weaned at birth and handfed. Usually, calves are permitted to suckle till the cows dry off or till the calves are 10 months of age, whichever is earlier.

Milk Production, Processing and Distribution in Madras State

By M. A. HAFEEZ, M.A.,
Joint Registrar of Co-operative Societies.

Production of milk in this country is taken up as a secondary occupation by the farmers and not as a main occupation, as is found in other countries like Holland, Denmark, New Zealand and others. In those countries any farmers owning land utilize the land in the cultivation of fodder crops and feed the entire produce of the land to their cows to convert it into milk. Their main occupation is ' Dairy Farming ' in the correct sense of the word and land becomes one of the factors of milk production. But in this country, the average farmer has a small holding and keeps only one or two cattle. His main occupation is to produce cash crop and treat Dairying only as a subsidiary occupation.

Seasonal Variation of Milk Production

Cows and buffaloes are the primary producers of milk. These animals behave differently in the matter of milk production. The cows generally calve in larger numbers in a comparatively ' dry season ' during March and April and again in October and November. Due to this, the monthly variation in milk is less pronounced in a herd consisting only of cows. In the case of buffaloes, they have only one peak season of calving during the wet months of July to September which results in a marked increase in milk production from October onwards up to January each year. Thereafter, it begins to fall off and is at its lowest level during the warm and dry months of May and June.

Wherever the buffalo is the main producer of milk (and it is so in most parts) there are marked seasonal variations, viz., decrease in the availability of milk in summer months and excess production of milk during winter.

Collection of Milk

In the rural areas where the bulk of the cattle exist, there is very little collection of milk in the sense understood by Dairymen. Only about a fifth of the entire production is needed for urban areas and only this quantity may be said to undergo a system of organized collection. Here again various types of agencies undertake collection of milk. There are the producers who collect milk from their neighbours and take it to the urban areas. There are also the professional middlemen who collect milk and carry it to the urban areas.

Collection on a large scale presents difficulties because of the scattered production of milk in the villages. The average production of milk in the country is less than 2½ maunds per day in the village. When it is considered that a major portion of it is converted into products or retained for domestic use, the marketable surplus available at a time is very small per village. It is therefore not possible to collect a reasonable quantity of milk in all the areas.

Only in certain dairy tracts and also in the vicinity of cities the production is concentrated and collection becomes easier although even there it can hardly compare with the output per square mile in some of the dairy countries abroad. Even here there are serious draw-backs as the animals maintained for milk production are poor yielders and not economical to maintain. For any large scale production of milk therefore a greater number of animals will have to be maintained in any one unit.

Co-operative Dairying

At one time a situation existed in most parts of the country when milk produced in rural areas could not find a lucrative market on the one hand and on the other, there was a crying need for milk in urban areas. As the resources of the average farmer-producer are very limited, very little could be achieved through his own individual effort especially in the dairy line which called for larger investments and involved larger risks than his agricultural activities.

A collective effort was therefore needed to bring about progress in dairying. This brought into being the formation of co-operative milk societies in rural areas. The first successful effort in this direction was made in Madras State in the year 1925 when the first dairy with up-to-date equipment for receiving and processing milk was established in the Madras Co-operative Milk Supply Union.

This was later followed by the formation of similar milk supply unions in many of the important towns in this State. The societies are local units situated on the outskirts of a town or city and their main function is to collect milk from individual milk suppliers in the villages by letting them milk their animals at a common milking yard under their supervision. The milk assembled at such centres is then sent through motor transport to the Unions situated in the urban centres to which the societies are generally affiliated. At the Unions the milk is tested for quality, pasteurised and issued for distribution to the consumers in sealed containers. Under the bylaws of a society, each member agrees to supply a minimum quantity of milk every day. Accordingly, the milch cattle of the members are brought to one or more central places twice a day and milking is done under the supervision of either a member of the managing committee or a Supervisor.

Milking of animals in a common milking yard under supervision ensures hygienic production of milk and prevents any attempts at adulteration at the production end. Particulars of the quantity of milk supplied, payments made, loans advanced, etc., are daily recorded in a pass book which is provided for each member. The total quantity of milk thus received is weighed and kept ready for delivery in sealed cans. The managing committee of each society looks after the administration of the society.

The Madras Milk Supply Union maintains a well-equipped central dairy, a pasteurising station for the pooling and processing of milk and also the necessary technical staff. The Milk Supply Union has also its inspection and quality control organisation to ensure the supply of pure and wholesome milk to the citizens of Madras. This organisation had to face innumerable difficulties to begin with but after the initial obstacles were overcome, it has earned the appreciation of the public and has stabilised the system.

Today the Union is the biggest organisation for the supply of milk to Madras City and caters one-fifth of the city's milk requirements.

Measures intended to Enhance Village Production

As a measure of augmenting the production of milk, the members of milk societies are generally advanced Government loans for the purchase of milch animals at a cheap rate of interest. The loan amount is repayable in the course of ten months based on the lactation period out of the sale-proceeds of milk. By this procedure the members get enough money for feeding their cattle after repaying their loan instalments and get complete ownership of the animal by the end of ten months.

At present the State sets apart nearly 12 lakhs of rupees every year for being advanced to the milk supply societies for the purchase of milch animals. Apart from these loans from Government, loans from the Central Bank are also taken. The Unions out of their own resources are also making advances to supplement the finances required for the purchase of milch animals. These loans are generally issued during the lean months of the year when the prices of milk and cattle are generally high. The farmer is therefore interested to see that some of his cattle calve in summer.

This spacing of calving is a practical achievement to the credit of these milk co-operatives. Dry animals are usually a burden on the farmers who are unable to maintain them. To preserve their usefulness a few of the Milk Unions like Madras, Kozhikode and Tirunelveli run salvage farms for dry animals, where they are looked after well and returned to the owners after calving at a nominal cost.

For improving the quality of the animals owned by the members, many societies maintain stud bulls of approved breeds. The Madras Milk Supply Union runs two key farm centres for upgrading the cattle by resorting to artificial insemination.

Treatment or Processing

In this country there is practically no consumption of milk in its raw state. Almost religiously, all consumers boil the milk before it is used. Even when the consumer is supplied with pasteurised milk in bottles, the habit of boiling milk at home before consumption persists. It is generally considered unsafe

to drink raw milk unless one is very sure of the source and the subsequent handling. There is no doubt that this universal practice has arisen out of conditions of production, handling and the climate prevailing in this country.

In cities it is very common to see the milch animals being taken to the door of the consumer and milked. Here the consumer is satisfied that he gets pure milk immediately after drawing from the cow. Milk collected in villages has to be pooled and transported to the urban areas from a distance of 30 to 40 miles or even more.

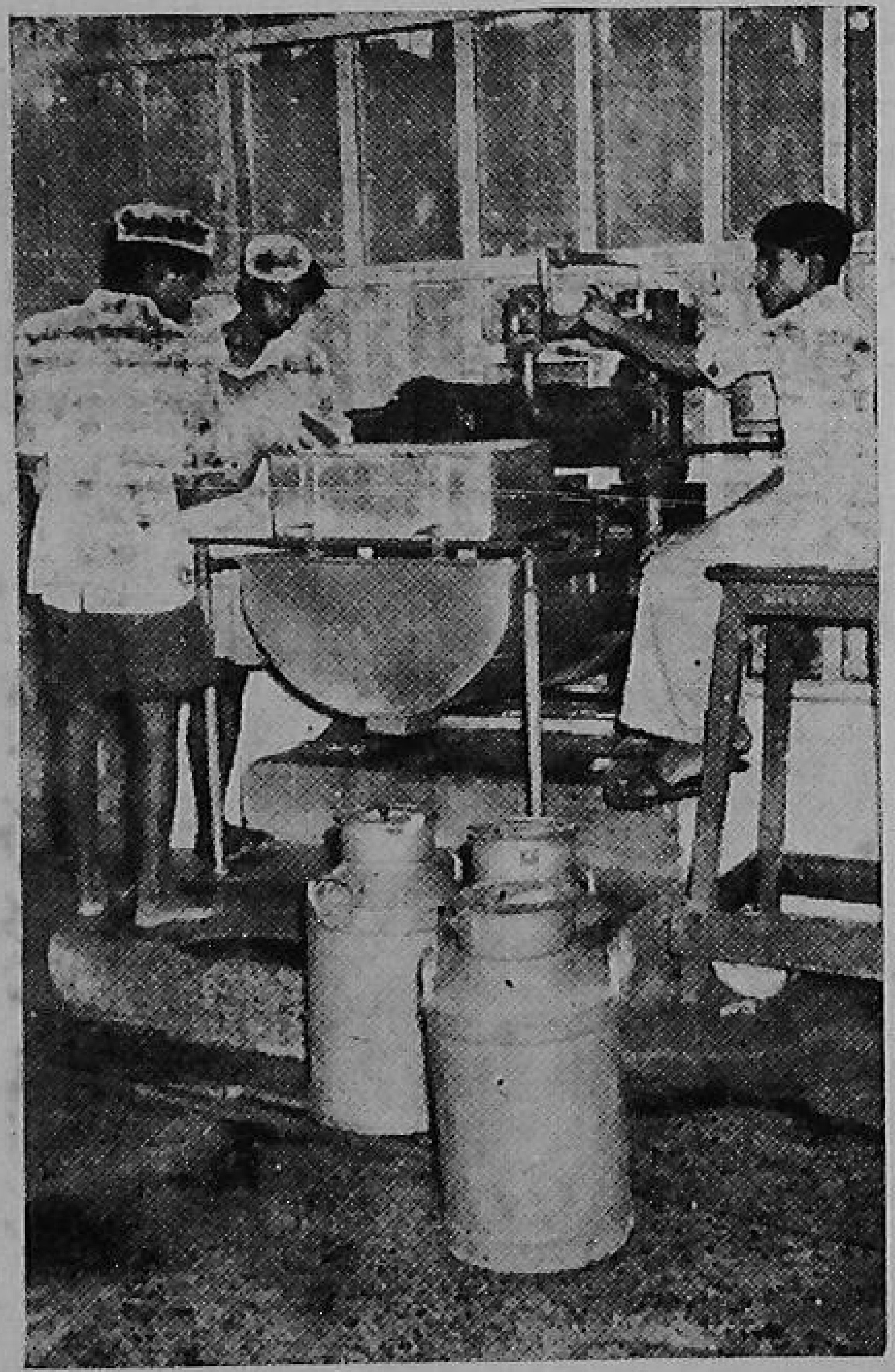
The practice of boiling milk at the production end in order to increase the keeping quality of milk is also followed in some areas. All kinds of transport, including head-loads, bicycles, carts, buses, and rail are used for transporting milk to the consuming centres. Raw milk generally reaches the place of consumption within about 3 to 4 hours of milking.

Pasteurisation of Milk

Military dairy farms were the first to introduce pasteurisation of milk in this country. Some private dairy concerns also adopted it for the civilian market at some of the bigger cities and hill stations. During the last few years certain State Governments have taken to pasteurisation in connection with their respective city milk schemes. On the whole, only a small fraction of the entire milk consumed is pasteurised before distribution.

The Madras Co-operative Milk Supply Union is the only institution in this State which has set up a pasteurisation plant for the heat treatment of milk. There are several other institutions which handle fairly large quantities of milk, but owing to the absence of any processing plant, the present handling of milk is being done under great strain.

If these institutions also instal pasteurisation plants, this great problem would be solved and the efficiency of collection and distribution of milk would be improved considerably. The surplus milk on any day could be brought back, processed and kept in the cold storage and distributed conveniently in some other distribution wards. This could save considerable wastage of milk that now happens. The advantages of



Pasteurisation plant

spacing milk distribution could be passed on to the producer and in turn the milking hours could be conveniently tuned to suit their convenience.

Since processing of milk results in the destruction of all harmful bacteria without losing its nutritive value, it would ensure a suitable method of supplying hygienic milk to the consumers. As pasteurisation of milk will also involve canalising all the milk to one factory, it will also help in the testing of milk received in batches from different sources and will thus ensure efficient quality control.

Almost all the co-operative institutions of this State have up-to-date equipments for the manufacture of by-products like butter and ghee. The conversion of milk is resorted to only in certain seasons of the year when the collection of milk is at its peak and is in excess of the distribution.

The manufacture of butter and ghee results in a loss of nearly 50 per cent and hence the milk co-operatives are always encouraged to sell milk in its fluid form as far as possible. Products like Ice cream and Khoa, however, have much demand and their

manufacture is also found profitable. Milk co-operatives are advised usually to convert their surplus into either of these by-products so as to minimize the loss, if not earn profit.

Milk for consumption varies from house to house and the milk has to be delivered at the door-step of the family. Loose milk is therefore distributed out of a can with the help of a measure into the vessel of the consumer. At times small metal cans with locks or seals are also used for household delivery. The distribution of milk has to be done both in the morning and evening.

Prevention of Adulteration

Perhaps there is no other food product than milk which can be adulterated so easily and without any cost at all. The responsibility of maintaining the purity of milk is primarily that of the producer, processor and distributor. This is generally the case in countries advanced in dairying. This outlook has helped the consumer to appreciate the quality, pay a premium for it and encourage consumption of milk and dairy products. Unfortunately these conditions are non-existent in this country with our producers and consumers.

Apart from the producers and distributors, the responsibility of safeguarding the milk supplies rests with public bodies like the Corporations, Municipalities and Panchayat Boards. There are numerous rules and regulations, prescribing legal standards with regard to quality of milk so as to ensure the marketing of pure and wholesome milk.

The difficulty is that their application and enforcement leaves much to be desired, and, therefore, frequently the milk co-operatives and honest dairymen have to face unhealthy competition from private agencies. It is, however, gratifying that of late public consciousness in this matter has been aroused and steps are now well under way to put down such disrespect and indifference to law.

Bottle delivery is yet to be initiated in this State. Apart from the improvement in the hygiene of the milk supplied in bottles, it will also offer the best known means of tamper-proof system. With delivery cans there is always the danger of adulteration by unscrupulous vendors.

Apart from the milk supply that has to be made in sealed cans to large institutions and hotels, the

household delivery of milk would be best done in bottles. At present, the distribution of milk by milk co-operatives is done to the upper middle class in separate sealed cans while to the middle class consumers through tap cans and to the lower income groups who are not regular buyers through the milk depots opened at convenient centres in the city or town.

In this State, the Co-operative dairying has rendered invaluable service to the milk trade. Both the producer and the consumer enjoy the benefits accruing therefrom. It has established a direct link between the producer and consumer. It has stabilised the prices of liquid milk in the market by bringing more milk from the areas which are away from the market and has supplied better quality milk to the consumer. It has also contributed much to the improvement in the quality of our milch cattle and has led to the upgrading of their stock.

Milk in the Indian Dietary

Milk is the nature's most perfect food as it is rich in proteins, minerals, and vitamins which are so essential for the growth and development of our body. The human system requires for its proper development, a certain amount of animal protein and milk is the only source for it, for the majority of Indians who are vegetarians. Though the various pulses, grains and edible oil-seeds supply a considerable quantity of vegetable proteins to meet the needs of the system to a great extent, yet it is absolutely necessary to have some form and quantity of animal proteins also, in the diet. Even for the majority of the non-vegetarian Indians, meat happens to be a luxury which they can seldom afford and is only consumed occasionally; so, on economical grounds milk should necessarily form part of their daily food.

The nutritional value of any protein depends largely upon its amino acid content and the milk proteins contain a wide assortment of all amino acids. The two principal proteins in milk are casein and lactalbumin and both of them are particularly important in human nutrition as they contain all of the essential amino acids.

In view of the special importance of milk as the sole source of animal protein for most of the population in India, the quantity needed in the average Indian dietary can be calculated on the basis of protein requirements. According to Indian standards, the requirement of proteins is 65 grams of which one quarter should be of animal origin. Thus the daily requirements of animal protein is 16 grams which can be had on a consumption of 16 oz. of milk. Our daily requirement of milk is 16 oz., whereas unfortunately the per capita consumption in India is round about 7 oz., and in Madras State only 4 oz. or thereabout. In an estimate of the adequacy of India's net food

supply for the nutrition of her population, it was found that whereas the total energy available was adequate, and the quantity of carbohydrates was actually in excess, the quantities of fat and animal protein are markedly deficient.

Milk, besides being the source of animal protein for most of the Indians, has a great value as a "Protective food". Vitamins and minerals constitute the protective elements and with a vegetarian diet derived from a very limited variety of foodstuffs, there is a serious risk of deficiency of both minerals and vitamins. As such an increase in consumption of milk is necessary for correcting the deficiency of these protective elements in the Indian dietaries, particularly where children are concerned.

Milk as Food

By Dr. P. Viswanatha Menon

For centuries milk has been recognized as an almost a complete food for mankind. It owes its nutritive value to its different constituents which are given below :—

Composition of milk—Cows' and buffaloes'

	Cow.	*Buffalo.*
Moisture per cent	87·6	81·0
Protein (g/100 ml)	2·9– 3·8	4·3
Fat (g/100 ml)	3·4– 4·4	8·8
Total solids (g/100 ml) ..	12·2–13·6	16·0
Carbohydrate (g/100 ml) ..	4·5– 5·0	5·1
Ash (g/100 ml)	0·65–0·75	0·8
Calcium (mg/100 ml) ..	111–140	210·0
Phosphorus (mg/100 ml) ..	90–107	130
Iron (mg/100 ml)	0·03–0·24	0·2
Vitamin A (mcg/100 ml) ..	40–220	162
Thaiamine (mcg/100 ml) ..	27– 65	..
Riboflavin (mcg/100 ml) ..	138–342	..
Nicotinic acid (mcg/100 ml) ..	66–110	100

Researches carried out during the past two or three decades in connection with the nutritional studies on milk have clearly established the fact that not only milk contains all the food constituents required in the human diet but also that they are essentially in proper proportions and in a form readily utilized by the body.

It is not only a suitable and complete food but in relation to other common articles of food it is also economical as shown below :

One quart of milk is equal in food value to :	Approximately 1 lb. ban meat, 4 lb. cabbage.
	10 eggs.
	2 lb. potatoes.
	over 1 lb. chicken.
	5 lb. turnips.
	3 lb. cod fish.

Experiments conducted by Dr. Boyd Orr on young school children have shown that children who received whole milk in addition to their normal home diet increased by 20 per cent in height and weight over those who did not get whole milk. This increase was also accompanied by improved general health. Milk is specially valuable to infants, nursing and expectant mothers in that it contributes more largely and more uniformly to their well being. One pint of milk supplies one-seventh of the adults daily needs and one-third of the child's requirements. Milk is a good tooth and bone builder as it is rich in calcium. It is also a good muscle builder by virtue of its protein content of high biological value. It also contains all the known vitamins in varying proportions and as a source of vitamin A is the most important of all our foods. This fact is particularly important as most of our staple foods are deficient in this vitamin.

It has been mentioned earlier that milk contains fats, proteins, sugar and minerals, viz., calcium and phosphorus and also vitamins. There are certain fatty acids which are indispensable for us. Milk fat is unique in composition in that it consists of glycery-lesters of a variety of fatty acids, from butyric (64) to stearic acid (c. 18). In no other fat in nature is there to be found such an assortment of fatty acids as are found in milk fat. Lactose in milk has been shown to increase the absorption of calcium and phosphorus from the intestine and their retention in the body. These minerals in milk possess a high assimilable value as compared with the corresponding minerals in other sources like vegetables. Of considerable significance is the ratio of calcium and phosphorus as also other elements like sodium, potassium and magnesium in milk. This proportion as it occurs in milk resembles very closely the proportion of these same elements in the human body. Moreover milk also contains all the other essential trace elements required by man.

In view of this milk has been pronounced by nutrition workers as an excellent source of calcium. This fact needs no emphasis since calcium is so essential in building the body skeleton as well as in maintaining the muscle tone. Though fruits and green leafy vegetables taken in liberal quantities supply calcium to the body, the facts mentioned earlier emphasize the importance of including adequate quantities of milk in the diet. The calcium content of milk which is nearly three times that of wheat, greatly exceeds that of corn and is four times as high as that of human milk.

Milk Proteins

Milk is however valued most for its protein content which has got a very high biological value. Proteins are organic substances which are essential constituents of plants and animals. There is no life without them. In animals the muscular tissue of the body is composed of protein. It consequently follows that protein is needed in nutrition for the growth and repair of the human body. In the human body proteins from the diet are used for two main purposes: (1) for the growth and repairs of the body and (2) for the production of heat and other forms of energy. The protein structure in the human body is not the same as that found in plants. Although it is similar to that found in animals it is not identical with that either. If the protein in diet is derived from vegetable sources a variety of food in quite large amounts has to be eaten so that the body may have the opportunity of picking up sufficient ingredients from various vegetable proteins for putting them as human muscles. If a protein in food is derived from animal sources less will be required since the degree of difference, between animal protein and human protein is less than that between vegetable protein and human protein. If protein is derived from a mixture of animal and vegetable sources the amount required may be as little as if it all came from animal foods since the variety of proteins available to the body may enable it to put together human protein, economically.

Essential Amino Acids

Proteins are made up of a number of amino acid units which are found in various kinds and arrangements in different proteins. The human body can convert many amino acids it does not need for its

own structure into others. There are however ten amino acids which the body cannot make and which has to be supplied in the diet. These ten are called the essential amino acids. The animal proteins usually contain the essential amino acids in proportion reasonably appropriate for human needs while vegetable protein may be lacking in one or other of them. For this reason animal proteins are called first-class proteins and vegetable second-class proteins. Milk proteins are thus first-class proteins.

Milk contains three types of proteins, viz., casein, lactalbumin and lactoglobulin. Properties and composition of casein are very similar to the phorpho protein of hen's egg vitellin. Casein constitutes to about 76 per cent of total proteins in cow's milk. Lactalbumin and lactoglobulin constitute 12·6 per cent and 5·4 per cent of the total protein in cow's milk. Proteins of colostrumare is important in that they possess immunilogical properties which they impart to the new born.

Digestibility of Milk

The digestibility of milk proteins is above 90 per cent whereas that of proteins of cereals, fruits or vegetables is 80 to 90 per cent. In the case of legumes the digestibility is 80 and lower. The average time taken by different foods to pass through the stomach is given below :—

	Hours.	*Minutes.*
1 Milk	1	..
2 Fruit	2	..
3 Sugar sweets ..	2	..
4 Bread	2	30
5 Egg	2	..
6 Fish	3	..
7 Vegetables ..	3	..
8 Meat	3	..

It is generally considered that foods which pass quickly through the stomach are more readily digested than those which do not. Hence milk is the most easily digested of all the foods.

Supplementary Value of Milk Proteins

It has been mentioned earlier that milk proteins have a higher bilogical value than either the pulse proteins or the cereal proteins. Milk proteins also act

as valuable supplementary proteins to cereal proteins both for the human specie and animals. Many experiments have been conducted to show the supplementary effect of milk proteins on rice and ragi plus pulse diet which is the common diet among human beings in South India. The results of a typical experiment conducted are given below:—

Name of foodstuffs.	*Grain in body weight of rates per gram protein.*
1 Rice	1· 7
2 Rice plus red gram	1·26
3 Rice plus bengal gram	1·21
4 Rice plus skim milk	1·81
5 Rice plus red gram plus skimmed milk ..	1·47
6 Rice plus bengal gram plus skimmed milk.	1·89
7 Ragi	0·71
8 Ragi plus red gram	0·96
9 Ragi plus bengal gram	1·19
10 Ragi plus skimmed milk	1·57
11 Ragi plus red gram plus skimmed milk.	1·38
12 Ragi plus bengal gram plus skimmed milk.	1·78

(Swaminathan, M. 1938 Ind. J. Med. Ed. 26, 112.)

It has been pointed out earlier that animal proteins are superior to either cereal or pulse proteins. Of the cereal and pulse proteins the former are superior to the latter. A mixture of rice and pulse proteins has a lower biological value than the rice proteins alone. This is due to the fact that the pulse proteins are deficient in the same amino acids as rice proteins and have a lower biological value. When milk proteins which have a high biological value and which contain all the essential amino acids are added to rice proteins a good supplementary effect is observed. Further the growth depressing effect observed with rice pulse mixture is also partially or totally removed on the inclusion of milk proteins in the diet. In the case of ragi, however the pulse proteins exhibit a supplementary effect but this effect is not so marked

as when skimmed milk is used as a supplement. Addition of skimmed milk to the ragi pulses diet definitely enhances the nutritive value of the diet.

Indian diets are predominantly vegetarian and contain a very large proportion of cereals and a small proportion of pulses. The nutritive value of such a diet is bound to be low. Addition of milk to such a diet is bound to have a supplementary effect. This supplementary value of milk proteins is of the greatest importance in human nutrition.

Clean Milk

By Dr. S. Vancheeswaran.

Milk is nature's complete and perfect food and contains all the food constituents required for healthy development and growth of the young animal. It occupies a unique position amongst foods in that it contains all nutritive materials necessary for easy assimilation and rapid growth. It is the natural food for many animals and infants for varying periods after birth. It is also a valuable food for the aged and the sick.

It is of the utmost importance that milk should be removed from the cow in a clean manner and free from dirt and kept clean through all stages from actual milking of the cow to the delivery of the milk to the consumer.

Milk as it leaves the healthy cow is always clean and contains only a negligible number of bacteria of a harmless character. Clean milk is capable of keeping sweet for a reasonable length of time, but the presence of dirt and bacteria produces souring and curdling of the milk. Once milk contains bacteria and dirt, it is impossible to remove them and make the milk clean again. To avoid this, the milk should be drawn by clean hands into clean vessels and the udder and teats of the cows and buffaloes should be washed well and cleaned before milking. Clean milk production depends more on methods used in the collection, handling and distribution of milk than on buildings, cow sheds, etc., whose cleanliness and sanitation cannot however be overlooked.

The milk should be strained through efficient strainers and transferred to a cool storage as soon as possible or immediately it leaves the cow to prevent

bacterial multiplication. The milk should be pasteurised before distribution and where this is not possible the milk should be boiled before use to destroy all bacteria and dirt.

In milk production, cleanliness and sanitation are of utmost importance. The dung should be removed before milking and the udder and hind quarters of the cow should be well groomed and cleaned. The milkmen should be absolutely healthy and they should wash and disinfect their hands thoroughly. They should wear clean overalls and caps wherever possible and also use only covered pails well cleaned and sterilised by steam to collect the milk. The milk drawn should be removed from the cow-shed to the dairy as quickly as possible.

In the dairy the milk should be cooled immediately and later pasteurised. All milk vessels should be thoroughly cleaned and sterilised immediately after use with steam.

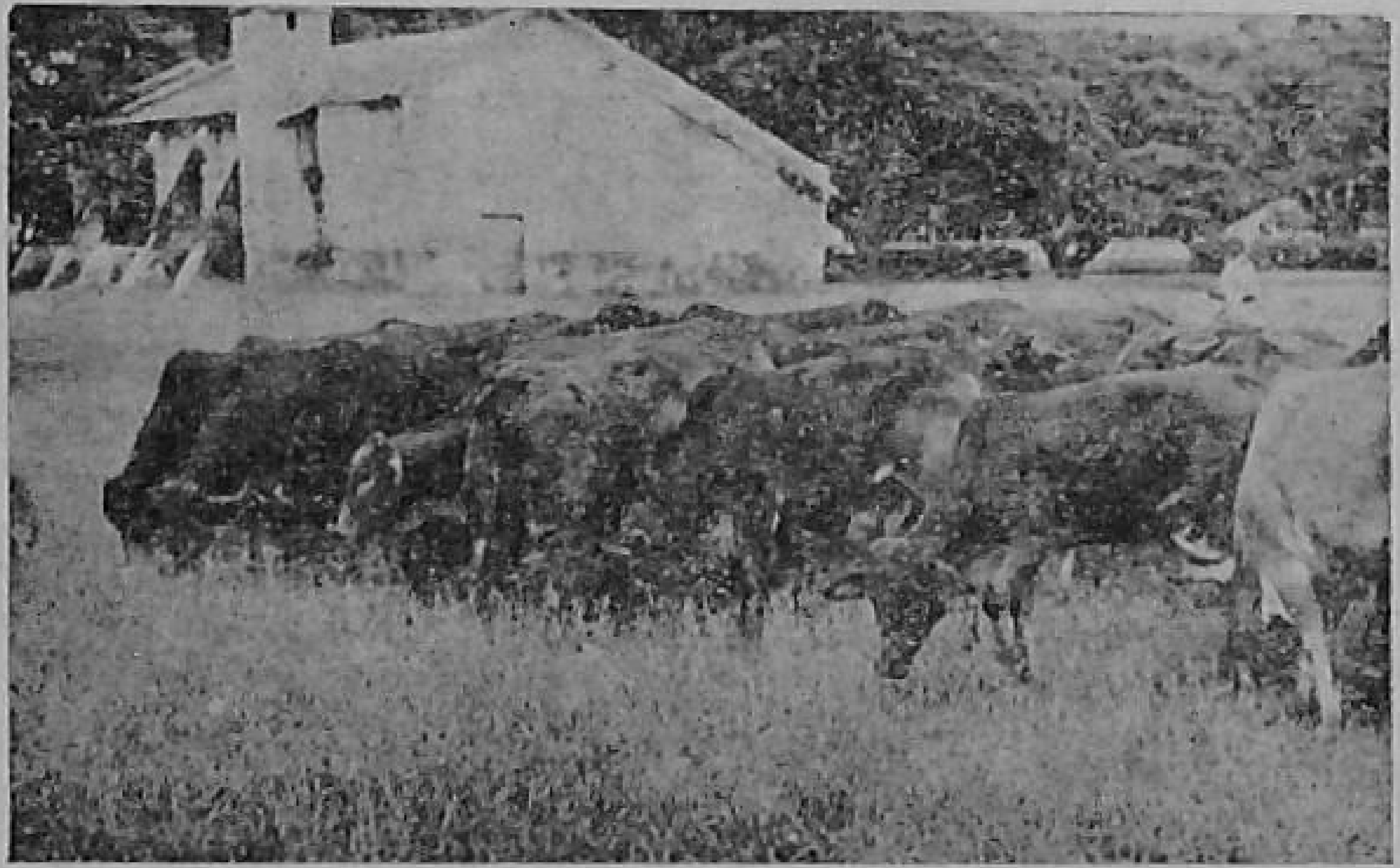
Care of the Milch Cow

To produce clean, good milk, all cows in the herd must be healthy. As the milk supply is chiefly affected by the udder, it is necessary to examine the udders of milking cows regularly and carefully, to detect any disease like mastitis or abnormalities which may affect the quality of milk adversely and render it dangerous for human consumption.

The cows should be taken care of well and fed on balanced ration. They should have good exercise daily and should have sufficient pasture to graze. They should be housed in properly ventilated stalls with good arrangements for sanitation. They should also be provided with copious supply of good drinking water, should have fixed hours for feeding concentrates and for milking. They should be groomed well and regularly every day to make them clean, to improve their coat and for better circulation of blood. The udder and hind quarters should be washed and dried well before each milking. The cows should be attended to carefully and handled tenderly with proper understanding.

The cows should be examined frequently for communicable diseases like mastitis, tuberculosis of the udder and brucellosis. Cases of mastitis should be attended to and treated early while cows having

tubercular mastitis and tuberculosis of the udder should be eliminated from the herd. The milk taken from animals having diseases of the udder and brucellosis should be boiled well before use to kill the dangerous bacteria. Pathogenic bacteria ordinarily present in milk can be easily destroyed by pasteurisation, but in places where this facility is not available, the milk should be boiled well and cooled before use.



Sindhi Herd.

Essentials in the Production of Clean Milk

By Dr. K. Kandaswamy Raju

" Clean Milk " is defined as milk that is drawn from healthy cows, is of good flavour and free from dirt and contains only a small number of bacteria, none of which are harmful.

" Sour " and " off flavoured " milk and its products are not readily marketable and when the dairyman does find a market the price he gets is usually lower than what he would get if the quality was good. Further, the products from low quality milk are usually low in quality. On the other hand, milk and milk products of high quality not only bring better prices but tend to increase consumption and thereby extend the dairyman's market.

Safeguarding the wholesomeness of milk supply protects the health of the calves and the large number of consumers. If milk is essential for the infant, it is no less important to the adult. The consumer will demand milk as food only when he has confidence in its wholesomeness. Health is endangered not only by the presence in milk of specific disease producing organisms, but also by the presence of other organisms which when present in large numbers, cause digestive disturbances. Another consideration for the consumer is the loss from souring or otherwise spoiling before the milk can be used. The cleaner the milk, the longer can it be kept in sweet and wholesome condition.

Clean, well ventilated and well lighted stalls are necesary to keep the cows clean and healthy and this in turn is helpful in producing clean milk.

The building in which milk is handled should be so located as to be free from dust and stable odours. This building should also be well ventilated and well lighted and the doors and windows should be fitted with wire meshes so as to keep out the flies and other insects.

The first step in the production of clean milk consists in selecting healthy animals that are free from diseases communicable to man. Among the several diseases communicable to man through milk, Tuberculosis is important. As such, all purchased animals should first be tested for T.B., with the help of Veterinarians and afterwards all the animals in the herd should be tested every year. The cows should also be blood tested for Brucellosis, as the organism is excreted through milk and even otherwise liable to contaminate the milk secondarily.

The body of the cow, especially those parts of the belly, flanks and udder that are immediately above the milk pail may be the source of bacterial contamination, because manure, loose hairs, bedding and other foreign matter may fall into the pail. As such before milking the udder, flanks and belly should be cleaned so as to remove dust and loose hairs.

Some human diseases as cholera, typhoid, scarlet fever, etc., spread through milk, the contamination taking place through infected dairy workers or flies or contaminated water or utensils. As such, it is very important to get all the dairy workers inspected by medical officers to ensure their healthy condition. The milker must observe personal cleanliness, especially of hands and clothing.

Buckets and other utensils should be seamless, well tinned and free from dents and sharp corners which are difficult to clean. The utensils should be washed thoroughly and then sterilized, to ensure clean milk production.

The water available in the farm should be pure and clean as this may serve as a source of danger in spreading diseases.

Disease-producing organisms may be carried from exposed excreta by insects, flies, rats, birds, etc., or they may be washed into the water-supply. Stable manue should be disposed of in such a way that there

is no possibility of their being a source of contamination of milk. Locate the manure pit at a safe distance from the cattle yard and carry all the excreta from the yard to the manure pit as soon as it is voided particularly at milking time.

Flies are a serious menace to the production of milk, as they carry millions of bacteria on their feet and bodies owing to their filthy habits. Fly breeding is effectively controlled by proper disposal of manure. They can also be cantrolled by periodical spraying with D.D.T., of the stalls.

The feed and weed flavours should be kept out of milk as they make the milk unsaleable. The flavours can be kept off, by feeding the animals with highly flavoured feeds immediately after milking and not just before.

Some Special Aspects of Urban Milk Supply

By Captain U. K. Menon

It is a well known fact that apart from small areas in the Punjab, throughout the rest of India milk is in short supply. The result of this state of affairs is mainly two-fold. (1) At the production end there is no question of any ethics. Milk is produced under most insanitary and careless conditions and is widely adulterated. (2) At the consumers' end it shuts off this essential commodity from the lower income groups which constitute the bulk of our population.

Nutrition experts are unanimous in prescribing a minimum of 8 oz. of milk per head as part of the general diet necessary to keep the basic nutritional level. How far we are from this objective is too well realized. We are not in a position today to assure the minimum quantity of milk required for normal nutrition, even to the vulnerable groups of our population, viz., growing children and pregnant mothers.

How to Assure the Minimum Requirement

In planning any scheme for milk supply the objective should therefore be to satisfy this minimum requirement. How quickly we can attain this objective depends on the following factors: (1) Organization of the trade, (2) Increasing the output, (3) Cheapening costs and (4) Adopting a policy of marketing which will ensure a steady distribution system. It is worthwhile to review the position under these heads while analysing the progress achieved

with respect to the Milk Supply Schemes in the Madras State.

The need for an organized system of milk supply has been a matter of sufficient magnitude to attract the attention of the enlightened public. The organization of existing sources of milk supply is complicated because of the rather peculiar economic conditions of the producers.

Urban Sources of Milk Supply

In any urban area a large majority of animals are maintained by hereditary milkmen of the shepherd class, who have been plying this occupation through generations. Most of them on an average own three to four cows. They act both as producers and retailers. Due to this dual role they are obliged to play they are forced to keep their animals as near them as possible. The rapid increase in urban population during recent years has created severe problems of accommodation, rent, cost of maintenance, etc., with the result that this class of traders have been forced to conduct their business under the most insanitary conditions. Public agitation has been going on against this menace to public health. Despite all this, even in a premier city like Madras this class continues to operate their business. The one great objection against taking a decisive step to remove this blot on the city, is the general reticence against dispossessing the source of income of one class of traders. Public agitation in future years is bound to become stronger and it is well that we think of a plan to gradually get rid of these insanitary pockets within the city.

The Bombay Milk Plan is a bold step in this direction. Under this plan almost the entire city has been rid of what was popularly known as " the cattle menace." The city of Calcutta has now followed suit. The Calcutta plan has improved upon the original Bombay Milk Scheme in the light of experience gained, with the result that it is expected that the Calcutta Plan would be lighter on the exchequer and at the same time sounder. Even the comparative smaller city of Delhi has launched a milk scheme emulating the example of the two big cities.

The question of taking up a similar scheme in Madras City has been examined a number of times. Most recently Government constituted an Expert

Committee to go into the question of Madras City Milk Supply. Amongst other recommendations made by the Chairman Dr. A. Lakshmanaswami Mudaliar in his report is one for the immediate appointment of a Milk Commissioner in order to work out a City Milk Scheme on the same lines as the Bombay and Calcutta schemes.

The problem of the producers in the city can never be expected to find a solution till a milk plan is adopted. Organization with reference to city production has been attempted by the institution of co-operative bodies. Invariably the City Milk Supply Societies depend on the contracts for supply of milk to the city hospitals. If for any reason the hospital supplies are lost to the co-operative union it is almost certain that the City Milk Supply Societies will all have to be wound up.

Rural Sources

In no urban area in the State is the cattle population within it, sufficient to meet, the entire demands of the urban area. Naturally the deficit in the supply position has to be met by receipt of milk from suburban villages that lie within transportable distances. The village milk supply has its own difficulty (for example) the average village production is only about 60 lb. The difficulty involved in collecting these small quantities of milk from scattered homesteads in several villages and transporting it to urban areas for distribution is great and particularly so because milk is a highly perishable commodity. The obvious answer to these difficulties would be the starting of large scale dairy farms from which bulk supplies could be tapped. Unfortunately dairying has never been a remunerative industry. Several factors constitute to keep the large-scale investor out of this industry, the main reason being that the quality of cattle stock itself is too poor to be economical. Again the price of milk itself is relatively high when compared to the low purchasing power of the population which forces the organization to keep margins of profit low. To these the risk of losing capital from disease and death of animals is an additional bogey. Under such conditions therefore the task of tapping, collecting and transporting the milk produced in the villages, however difficult, has necessarily to be undertaken.

It has been found from practical experience that co-operative organization offers the best solution for tapping rural supplies. This mode of organization ensures a fair return to the producer by reducing the number of intermediaries in the trade and also assures the consumer a steady supply at reasonable cost. The organization relieves the producer of the task of finding a suitable intermediary and leaves him sufficient time and inducement to concentrate on increased production. The co-operatives themselves are more amenable to direct Government control than any other type of organization. In this State the work of organization is nearly complete. Almost all the major panchayats and all the municipalities are served with milk co-operatives.

The Problem of Quality Control and the Remedy

The greatest difficulty that has been facing the working of these organizations is the cut-throat competition that exists in the trade. Widespread adulteration of milk is more a rule than an exception. Though legislation for controlling unclean and impure milk is existent, yet effective administration of these Acts has not been possible. Even in the larger municipalities few samples are taken for analysis. The conditions are so bad in many places that the consumer who is particular about the genuineness of his supply is forced to keep his own cow. The co-operatives themselves despite all controls and checks are still not far from being without blemish. The difficulty about co-operatives is that they cannot sell milk on credit. Most of the middle and lower middle class are particularly concerned with the credit facilities offered and cheapness of the commodity. Quality is a subsidiary consideration.

Apart from the dangerous effects on health of the population which results from consumption of unhygienic milk, the effects on nutrition which results from scarcity of supplies, the malpractices which are so prevalent in the trade in the face of legislation would have severe moral repercussions on the sanctity of law. Under existing conditions it would require an army of staff to make legislation effective. The existing checking system in the State itself has its limitations, for example 'A' class municipalities with a population of five lakhs can send only twelve samples per month of food materials for analysis. Of-

these twelve the number of milk samples that are sent is not known. A limitation has to be made because the chemical analyst's laboratory in the city can only take up a limited number of samples for analysis. Many of the major municipalities have recommended the setting up of laboratories at the rate of one per district. Even if this were done there would still have to be limitations on the number of samples.

To be effective, therefore, the answer to the problem of quality control is obviously internal. It should be made obligatory on the part of institutions, agents or bodies to have a tight internal check on the quality of milk. The administrators of the Acts should be left only with the task of conducting super checks. In other words the trade in any particular urban area has to be forced to organize itself, if quality is to be effectively controlled. The individual trademen and vendors now operating independently have to take their supplies from a recognized source. The best way to introduce this measure is to prevent the sale of milk other than through organized institutions.

After the first stage of organization the trade channel is bound to crystallize and settle down to specific institutions. It has been discussed in the preceding paragraphs that institutions of a co-operative nature offer the best means of tapping rural sources and that the urban sources of production have necessarily to be shifted to convenient areas suitable for the rehabilitation of the trade.

Increasing Output

There are only two ways of increasing output. (1) Increasing the stock and (2) increasing the per capita yield of cows. It will be easy to increase the stock by widening the area of operation and by a planned programme for issue of loans for purchasing milch cattle. The co-operative organization also offers an effective means for the transaction of loans. In this State, apart from Government providing an annual sum of Rs. 12·5 lakhs for loans to co-operative milk supply organizations, many Central Banks also issue loans to milk co-operatives. In addition institutions having their own financial resources utilize them for similar objects.

The question of increasing the average per capita yield of cows is a long-term measure which would have telling effects ultimately on the nation's

economy. A systematic breeding programme backed by scientific feeding methods is the surest way of improving the stock. The industry itself depends entirely on the quality of livestock. To facilitate an effective breeding and feeding programme it is very necessary to have organizations through which such programmes could be implemented.

In the case of urban areas it has been accepted by the Indian Council of Agricultural Research that a programme of cross breeding is the easiest and best method to improve the stock. In the suburban villages similarly a clear-cut policy is needed. It may perhaps be interesting to note, that the so-called Dairy Animals in the villages are almost exclusively buffaloes. The danger of cross-breeding the village stock and thereby effecting a deterioration in the quality of work animals is eliminated, if the breeding programme for villages is centred round improvement of buffaloes. The co-operative organizations in the villages could discourage keeping of cows. Buffaloes in the villages could easily be graded up with murrah bulls. It has been estimated that a systematic programme of breeding and Animal Husbandry would be able to double production within the space of five years.

Cheapening Costs

Organized handling of milk by itself will reduce the cost to the customer because it will remove the intermediaries in the trade. At the producers' end it will effect a saving resulting from the assured and steady market. The producer will be rid of the trouble of being a bill-collector and a retailer and will consequently have more time to concentrate on the problem of increasing production. Increased turnover, as in any other trade, is bound to reduce costs.

The installation of milk-processing machinery will increase the longevity of milk and provide sufficient time for marketing. Since this is a method of preventing wastage it may be possible to reduce the cost of milk further. By processing milk it will be possiable to guarantee its safety so far as the consumer is concerned.

The installation of pasteurization plants in the major towns and cities of the State will therefore help organizations to increase their capacity; at the same time ensure consumers safe milk at a reduced cost.

It has been assessed that a reduction in price of milk by half the present rate will quadrupie the off-take. Consumption of milk is, therefore, bound to go up and the increased off-take and quicker rolling of stocks, will lower operation costs further and reduce consumer prices.

There is a usual misconception that if the prices of cattle feed commodities come down there is bound to be a reduction in price of milk. If this were true the question of cheapening of milk prices is as good as solved. What is not usually realized is that along with any fall in cattle-feed prices there is bound to be a fall in purchasing power. In fact these two factors are so closely inter-related that in recent years Government have been forced to take action to check the fall in prices in order to keep up the purchasing power. The solution to bring down the prices of milk therefore does not rest on bringing down the prices of cattle feed. On the other hand, it depends entirely on organized handling and marketing of milk.

Improvement in Distribution

When a commodity is in short supply the organization which undertakes distribution should normally have no difficulty on the sales side. Establishing a regular clientele and increasing their numbers is the best means of sales promotion. In the case of co-operatives their constitution and working have revealed certain defects in marketing. The large

Milk being sent outside for distribution by a Milk Co-operative society.

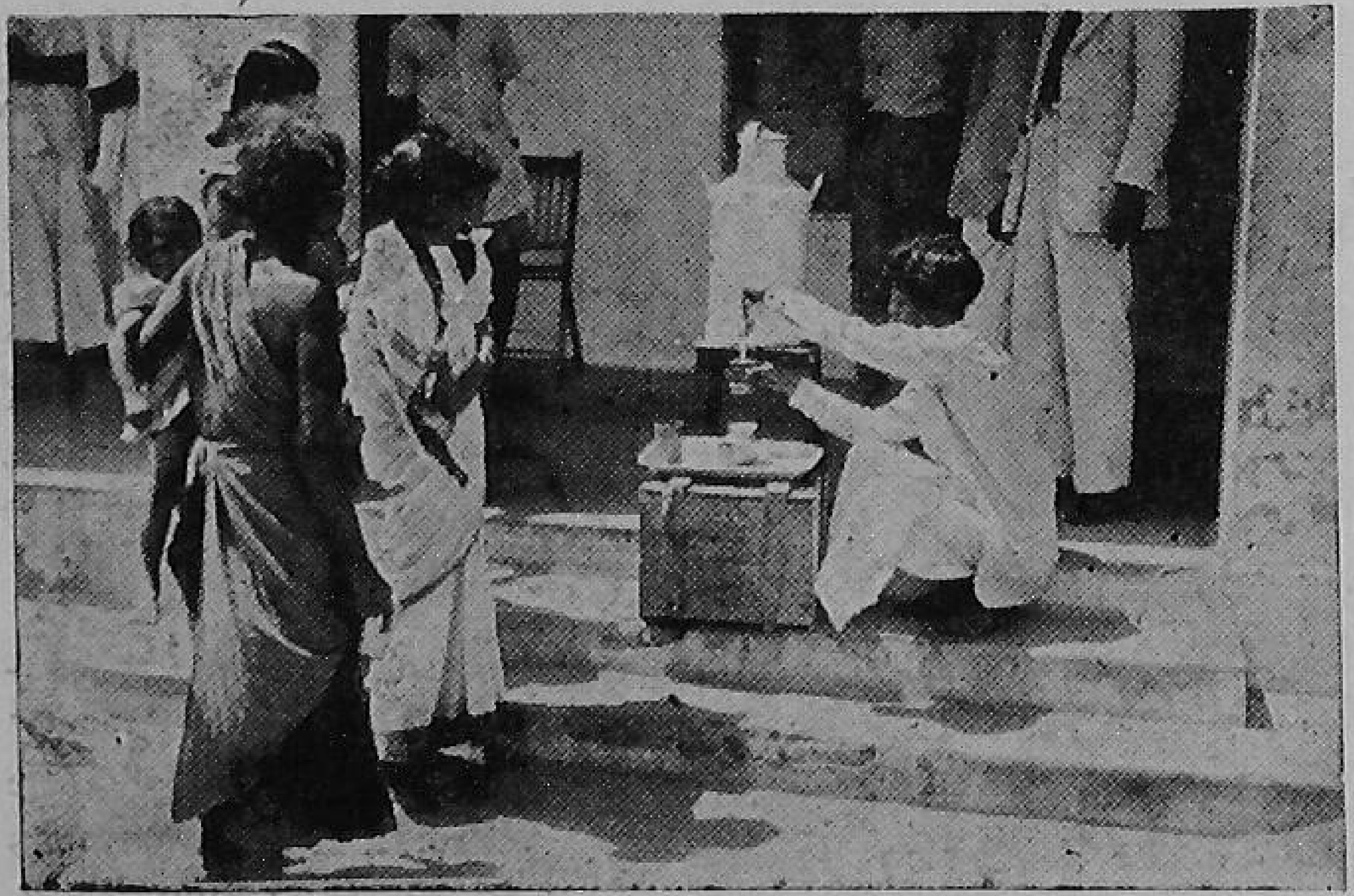
amount of wastages which arise during the surplus season is a pointed evidence. Many institutions lose the profits gained during the whole year in the wastage that occurs in one or two months of the surplus season. The problem of seasonal surpluses is not peculiar to this country. Throughout the world there is a definite freshening season and soon after there is a spurting up of milk production.

In the more advanced countries of the west a solution to these problems has been found by spacing the calvings. Industrialists see to it that there is an all the year round calving programme, whereby a steady floor-level of production is ensured. It cannot in any measure be said that the problem of surplus milk is so vast in this State that it is difficult of solution. On the face of it, a short supply commodity can never become surplus to requirements. The difficulty is that the customers prefer a steady all the year round supply and therefore the institutions that handle milk find it difficult to canvass temporary customers to absorb the seasonal surpluses. The co-operatives themselves are so constituted that they are organizations of producers. Producer interests will therefore be always against a cut in the price structure even though it may be temporary. The result is that these co-operatives prefer to keep back a portion of the milk they produce rather than reduce the price of market milk and increase the off-take.

This drawback in the marketing side can be met only, when and if, marketing of milk is taken off the hands of producer co-operatives. If the producer organizations are to market milk they will have to depend on paid hirelings to canvass sales. Promotion of sales cannot be expected unless effective canvassing is backed by a corresponding reduction in prices. The inducement to the customer is mainly reduction in cost. This being widely opposed to the interests of the producer, the only way of reducing prices is by a policy of stiff consumer resistance, which would make the commodity surplus to requirements.

It is too much to expect in this country, at its present state, that consumers can be so effectively organized as to offer such a resistance. In the advanced countries in the west the clash of interests between the producer and the consumer has been partly met by the setting up of " Milk Marketing Boards." These Boards have on them both producer

and consumer interests represented. Where they function, they undertake the marketing of milk. The Boards have on their management strong Government representation in order to ensure their fair and smooth working. It has been agreed by authorities responsible for drawing up of the Second Five-Year Plan that similar Boards have to be set up in this country.



Distributing milk at a Co-operative Depot.

Bombay Distribution Plan

Perhaps the best system of distribution that exists in India today, is under the Bombay City Milk Plan. In this case the Bombay Government undertakes the distribution of milk. The only improvement that could be effected on the distribution side is to nationalise it or alternatively to entrust it to a quasi-Government marketing body.

The greatest boon out of organizing the distribution end independently will be the complete suppression of all malpractices. Government control in the distribution of short supply commodities is not a novel idea. During the war years and even till recently rationing of almost all food commodities in short supply has been working. Though there is a general aversion to rationing because of the implied blackmarket that may develop, yet with regard to milk there is an obvious difference. In the case of milk there is no fear of developing blackmarkets as has been amply proved in the case of Bombay milk supply. The quickest way of realizing the aim of assuring the

minimum nutritional requirement of 8 oz. of milk per head is therefore by nationalizing the marketing part of the trade. Such a measure will obviously be the best solution to the consumer interests and at the same time will be of considerable help to the producer.

Urban milk supply falls under two categories, (1) Supply from within the city and (2) supply from rural sources within transportable distance. The conditions of production in urban areas are unsatisfactory in every respect. To solve this, it is suggested that milkmen's colonies be started with the object of rehabilitating both milkmen and their cattle. The rural sources of supply should be drawn through co-operative organizations. It is suggested that the marketing end should be nationalized or alternatively Milk Marketing Boards should be set up. All the institutions that undertake the supply of milk in urban areas must be forced to keep their own system of internal checks in order to assure quality. Milk Marketing Boards or the nationalized marketing agencies will be equipped with pasteurisers and handle only processed milk.

These measures are expected to increase production and bring down the prices of milk so that the object of assuring the populace of the minimum nutritional requirements of 8 oz. per head could be reached within the shortest time possible· at least these measures would bring the prices of the commodity within the reach of the lower income groups of the population.

Livestock Development in Madras State

The total bovine population of the Madras State is 145·6 lakhs of which 31·3 lakhs of cows and 11·5 lakhs of buffaloes, only are useful for milk production. Yet, with this great cattle wealth, the milk production of our State is very low, the average yield of milk of a cow being only 413 lb. per lactation which is only a fraction of that achieved in many other countries. On account of low production, the per capita consumption is also less than 4 ounces. For the majority of us in the State who are vegetarians, the sole source of animal protein is milk and according to our standards, the requirements of proteins is 65 grams of which one quarter should be of animal origin. Thus the daily requirements of animal protein is 16 grams which can be had on a consumption of 16 oz. of milk. The daily requirement of milk for every individual is 16 oz. whereas unfortunately the per capita consumption in our State is only 4 oz. Obviously with the present level of production, it is not possible to build up our supply to the requirements of nutritional standards and our Government, realising this, are taking active steps to increase the output of milk.

Planned Breeding

There is no doubt that one of the causes for the low productive capacity of our cows is the unsystematic way of breeding. We have in our country breeds noted for their milk yield capacity such as the Sindhi, Gir, and Murrah and in order to increase the output of milk of our local non-descript cows and buffaloes, systematic grading up with bulls of such high milch strains should be resorted to. The importance of developing good strains of milch cattle without

detriment to the already existing draught breeds, cannot be lost sight of in the 'grading up' plan. Our bullocks are the main suppliers of motive power for all agricultural operations and the breeding policy should be such that the requirements of the production of work bullocks is not ignored. The policy of the Government is therefore to grade up cattle in rural areas for production of work animals and in semi-urban and urban areas for milk production and this 'grading up' work is being undertaken in a planned manner through the Government Livestock farms, through distribution of bulls and granting subsidies for their maintenance and more recently through the All-India Key Village Scheme.

There are five livestock farms in our State now, viz., (1) The Livestock Reseach Station, Hosur, (2) The District Livestock Farm, Koila, (3) The District Livestock Farm, Malabar, (4) The District Livestock Farm, Pudukottai and (5) The District Livestock Farm, Orathanad, Tanjore district. Pure bred bulls are raised in these farms for distribution to selected areas for grading up the non-descript cattle. The well-known milch strain breeds such as Sindhi, Gir and Murrah are bred in these farms.

Pedigree bulls are also stationed at Veterinary institutions for grading up work.

There are other schemes functioning in the State, with Government subsidy, such as the Premium Scheme, Local Board Schemes and Malestock Distribution Scheme and there are 1,108 breeding bulls under the various schemes.

A large number of good cows and buffaloes are brought into Madras City annually for the purpose of urban milk-supply. Due to high cost of maintenance and want of proper accommodation in the city, most of these cows when they go dry are much neglected and even sold for slaughter. As only the very best are brought into the city, the continuous process of neglect and premature destruction of cattle of breeding value involves a rapid depletion of potential cattle wealth of the State, and to avoid this wastage, a scheme is functioning in the city by which cows fit for breeding are sent to a Government farm in Kambakkam Reserve Forest where the cows are taken care of during their dry period. The Co-operative Milk Supply Union, Ayanavaram, Madras, also maintains a farm for the salvage of city dry buffaloes.

There are four such salvage farms in our State now, to take care of the cows when they go dry, but there is scope for more such farms and in fact there should be a farm for every large town or city for cows when they go dry.

Key Village Scheme

The All-India Key Village Scheme, sponsored by the Central Government for the rapid livestock improvement on a countrywide basis, was introduced in our State during 1952–53. The primary object of the scheme is to step up the production of approved bulls by controlled breeding in compact and contiguous areas in the breeding tracts, so that the bulls so produced could be utilised in other parts of the country for grading up the non-descript cattle. A key village is an intensive cattle improvement unit working in a compact area containing 500 to 750 cows or she-buffaloes over 3 years of age, fit for breeding or milk production. All scrub bulls in the area are castrated, and only controlled breeding is adopted through approved bulls. In order to increase the usefulness of superior bulls, and to hasten the improvement of cattle, artificial insemination technique is made use of and four villages with 2,000 to 3,000 cows or she-buffaloes are attached to each artificial insemination centre. All the cattle in the area are periodically protected against contagious diseases. Breeding societies are being formed to organise the supply of feed and fodder on co-operative basis and to undertake marketing of animals and animal products to the best advantage of the producer. Milk recording is undertaken to watch the progress of milk yield from generation to generation. Due attention is paid for the improvement of pasture and for raising fodder crops. In order to give an incentive to the breeders to rear the male progeny well, a scheme for the grant of a subsidy of Rs. 5 a month per bull-calf has also been introduced. There are at present 15 Artificial Insemination Centres of which one at Cinchona on the Anamalai Hills and those at Valarpuram and Kilacheri are for production of milch strain cattle. In addition, there are four more centres functioning in the cities of Madras, Coimbatore, Mathurai and Tiruchirappalli. In the National Extension Service and Community Project areas, and Block Development areas, breeding or artificial insemination centres are started and pedigree bulls have been supplied.

A scheme for cross-breeding of cattle in hilly and heavy rainfall areas, sponsored by the Indian Council of Agricultural Research, with the object of conducting large scale field experiments in cross-breeding of local non-descript cattle employing the semen of imported Jersy bulls stationed at Bangalore, has been initiated early this year. A field station at Ootacamund has been started and the preliminary work on survey and registration of animals, is in progress. It is a well-known fact that the foreign breeds like jersy, are famous for their high milk yield capacity and as such in our work in grading up cattle in the hilly areas, for their milk yield capacity, this cross-breeding scheme is bound to pave the way for more milk production within a reasonably short time.

Need to Improve Animal Nutrition

Any progress in our livestock development cannot be achieved by improved methods of breeding alone. Feeding is an important factor, and the quality and quantity of feed we give our cattle should simultaneously be improved if we should expect better productive capacity from them. The superior strains of animals obtained by grading could not be expected to develop the higher productive capacity and maintain the same over successive generations unless they are given adequate quantities of feed and fodder of good nutritive value. The Government Livestock Farms in our State are setting up a good example in this aspect and are raising and preserving the required quantities of fodder for their livestock.

The sewage of large towns and cities can very profitably be utilised for the production of cattle-fodder and in this direction the Mathurai Municipality has set up an example and has made available to the cow-owners of that city, valuable green fodder at a low cost. The example set up by Mathurai Municipality could be followed by other municipalities also profitably, by raising green fodder utilising the sewage without allowing it to go waste. A scheme for the utilisation of the sewage of the City of Madras at four different areas outside the city to bring 2,000 acres under cultivation is under the active consideration of the Government and on account of the high cost involved, it has been decided to implement the scheme in stages. The State Government in co-operation with the Corporation of Madras proposed to organise a milk colony at Erukkancheri with a 800 acre sewage

farm attached to it. It is proposed to colonise 1,000 cows, eventually working up to 4,000 cows, in stages. The Corporation of Madras is also contemplating to establish a dairy and sewage farm near Arambakkam. An area of 100 acres is to be brought under fodder cultivation and sufficient number of cows will be kept in this farm to meet the demands of the institutions administered by the Corporation. The contemplated milk colonies will go a long way in relieving the congestion of milch cows in the city and maintaining them under better conditions outside the city and augmenting the milk-supply to the city dwellers. The bulk of milk-supply will have to come through development of rural areas around Madras into milk pockets by affording facilities for rearing of superior milch cattle and the Government are giving help and encouragement in various ways to co-operative milk-supply work.

Co-operative enterprise

Much progress has been made in developing the milk trade in the State on co-operative lines. The idea of organising milk co-operatives was conceived as early as 1926–27 when a few Co-operative Milk-Supply societies were started in the outskirts of Madras City, but progress in the field of co-operative dairying, was slow for a period of about 10 years. In 1940, the Government appointed a Dairy Expert to advise Co-operative Milk Supply institutions on technical matters and to train their members and staff in the principles of dairy hygiene, etc. In 1946 they sanctioned the employment of a Dairy Development Officer and a skeleton staff to attend to planning, survey, formulation of schemes for increased milk production, collection, transport and distribution, propaganda and publicity. Since it was found that the volume of work could not be coped with by the skeleton staff the Government sanctioned in 1948, a three-year plan which at the end of the period was further extended, for the development of milk-supply co-operatives in the urban areas, for organising fresh milk-supply societies, supervision of supply co-operatives and for provision of technical advice and Veterinary assistance. The work of organising milk-supply societies in the new centres was taken up and on 30th June 1954 there were 20 milk-supply unions and 526 milk-supply societies operating in the Residuary State of Madras with a total daily production of 36,715 Madras measures. A separate co-operative

scheme is in operation for the supply of milk to the city and the Madras Co-operative Milk Supply Union which was started in 1927 is now the premier institution of its kind in the south. It has grown from humble beginnings to its present stature with 150 feeder societies spread over 600 villages in Chingleput district and sending on an average 32,000 lb. of milk of good quality to the city.

The co-operative enterprise helps the farmers to purchase cattle, produce more milk and get a fair return for their labours eliminating the intermediaries. Government are giving help and encouragement to co-operative milk-supply work, in the State, by way of financing partly for purchase of milch animals, by granting subsidy for maintenance of breeding bulls and by providing Veterinary aid, and staff for daily development.

The quantity of milk handled by the co-operatives, in raw condition, was about 390 lakhs lb. in 1952–53. Pasteurisation of milk is done now only by the Madras Co-operative Milk Supply Union and there is a proposal for installation of pasteurisation plants in four big milk-supply unions and at Ootacamund.

Increasing Milk Production

The unique nutritive value of milk and its importance on the dietary of the people have been universally recognized. Milk is an ideal article of food. It is one of the few foods which is consumed in its natural state. It is the one foodstuff which aids the growth and development of children. This has been amply proved by experiments conducted by feeding children with milk and recording the average increase in weight periodically. Milk is the one food which in sickness nourishes and sustains the body because all constituents of milk are easily digestible and are well balanced. In a country like India where considerable sections of population are vegetarians, milk is of special value and an increase in its consumption will help to supply the existing deficiency in the Indian diet. Its consumption is not confined to any section of the people. In some form or other, either as fluid milk or buttermilk, or with coffee or tea, it is consumed by all classes of people, young or old, rich or poor. It is of particular value to children, to the expectant and the nursing mother. " There is no finer investment " wrote Mr. Winston Churchil, the great War Leader, " than putting milk into the mouths of babies ".

Though milk has been recognized as the most perfect food known to mankind, it must be admitted that in our country, at any rate, the proper production and distribution of this article have not received adequate attention. Statistics show that India possesses about a third of world's recorded cattle population. From the point of view of production per head of human population, however, India falls to the lowest place among the important countries in

the world. The per capita consumption of milk is only 5·8 oz. in India while it is 56 oz. in New Zealand, 45 oz. in Australia, 43 oz. in Denmark, 39 oz. in U.K., and 33 oz. in U.S.A. In India the per capita consumption ranges from 1·23 oz. to 16·89 oz. (East Punjab). Madras State has a per capita consumption of 4·18 oz. The minimum per capita requirement of milk in India is stated to be 8 ounces. The increase in price of milk on account of the increased cost of living owing to the inflationary spiral and the diminution in the purchasing power of the people account for the poor consumption of milk in a poor country like India.

The problem that confronts us to-day is, therefore, to increase the total output of wholesome milk to keep its prices within the purchasing power of the people. But its solution bristles with several difficulties. The majority of the animals maintained in town are owned by men of limited means. Being obliged to keep the animals near the customers and accommodation being scarce and rent heavy, they cannot afford to provide better sanitary conditions. In the interest of Public Health, therefore, it is not desirable to increase production of milk *within large towns and cities.* It is better to tap and develop rural source of milk supply. In villages, production of milk is not an industry in itself but it is a side-line of agriculture. The difficulty involved in collecting the small quantities produced in villages and transporting that to urban areas for distribution to innumerable consumers, is indeed a great problem. It is particularly so because milk is highly perishable and should be consumed within a few hours of its leaving the udder of the animal.

Experience has shown that the most suitable agency for tackling this problem is the co-operative organization composed of owners of milch animals. While ensuring a fair price to the producer, the Co-operative Milk Supply Societies have been able to supply milk of good quality to consumers at less cost by reducing the intermediaries in the trade. They are amenable to supervision and control by the Government. " Service ", not profit is their motto. It is stated that in countries like Denmark, Sweden and Norway more than 30 per cent of the national output of milk are handled by co-operatives.

Following the above examples, a milk supply co-operative union was first started in the Madras State in the outskirts of the Madras City in the year 1927 with 13 feeder societies with a view to providing a subsidiary occupation to the agriculturists who are members of the feeder societies and supplying pure and wholesome milk to the consumers at a reasonable price. It passed through several crises in its initial stages but to-day it has established itself as an outstanding example of the successful application of the co-operative method for the solution of the problem of milk supply. The Madras Milk Supply Union is one of the biggest of its kind in India; it is supplying about one-fifth of the total quantity of milk consumed in the City of Madras. It is the sole supplier of wholesome milk to all the State Hospitals in the City for the past several years besides supplying milk to public institutions and the general public.

The sucess that attended the Madras Co-operative Supply Union encouraged the formation of similar organizations throughout the State. During the last ten years and particularly on account of the conditions created during the last war, the working of these organizations received an impetus. The Milk Supply Unions at Coimbatore, Madurai, Tiruchirappalli, Tanjore and Tirunelveli are outstanding examples of this co-operative enterprise.

Government Measures to Augment Milk Supply

In order to increase the supply of milk to urban areas, Government sanctioned early in 1948, a three-year plan. The plan envisages (1) the organization of more milk supply societies and unions in areas not served by such institutions; (2) strengthening of existing milk supply societies and unions; (3) supervision over the working of the milk co-operatives and (4) provision of technical advice and veterinary assistance. This plan was implemented with effect from 15th October 1948. At the end of the first three years, there were 680 co-operative milk supply societies and 37 co-operative milk supply unions in the composite Madras State with a total daily production of more than 29,000 Madras measures. This plan was ordered to be continued for a further period of three years from 15th October 1951. The introduction of the three-year plan was a landmark in the annals of the co-operative milk supply movement. By the end of September 1953 there were in all 41

unions and 725 societies in the composite State of Madras. After the separation of Andhra, there are 19 unions and 529 societies in the residuary State with a total production of about 37,000 Madras measures per day. As a result of the introduction of the scheme which has now been extended up to 29th February 1956, almost all the municipal towns and major panchayats have been covered by a network of milk supply organizations.

While the three-year plan was formulated for the districts, a separate scheme was sanctioned in April 1951 for the Madras City. During and after the war, much difficulty was experienced in the Madras City for adequate supply of milk to the consumers. With a view to augmenting the supply of milk to the City through the Madras Co-operative Milk Supply Union, by 5,000 lb. a day, Government gave the necessary staff free of cost for supervision and for the work connected with quality control. A non-recurring expenditure of Rs. 1·11 lakhs and recurring expenditure of Rs. 20,500 per annum was sanctioned and an up-to-date laboratory with equipment to analyse and test the milk supplied by the union was established. As a result of these steps, an additional production of 5,000 lb. per day was reached.

Assistance by Government

Government have encouraged the formation and growth of these organizations in several ways. Foremost among them is the provision of loans for the purchase of milch animals recoverable within a year in easy instalments. These loans were granted free of interest for several years. But now interest of 4 per cent is being charged. Veterinary Surgeons inspect the animals belonging to the members periodically free of cost. The services of stud bulls stationed at Veterinary hospitals are also available without payment of fee. Grant of poramboke lands for growing fodder, permission for free removal of monsoon grass for ensilaging and to graze cattle in forest lands, payment of higher rates up to 5 per cent over the market rate or the lowest tender rate whichever is less in the case of supply of milk to hospitals and jails, exemption of these societies from payment of security deposits, exemption of sales tax at single point, etc., are some of the concessions conferred by Government on the milk co-operatives.

Though the milk supply societies have attained conspicuous success, they still suffer on account of several disabilities which thwart their progress. Problems such as disposal of surplus production, maintenance of cattle during their non-lactation period, want of facilities for growing fodder and grazing pastures, protection of the animals against contagious diseases have got to be solved in an effective manner by the milk co-operatives. In short, increase of milk production and consumption can be achieved by paying better attention to breeding, feeding, management and disease control of cattle.

The celebration of 'More Milk Day' in the State on 14th April 1955 has evoked greatest interest among the public and has given a further impetus to increasing milk production so as to make milk available for consumption to the common man at as cheap a rate as possible.

Salvage of Dry Animals

It is often the case that good animals when they go dry are sold to butchers by the owners, mainly owing to their inability to maintain them during the non-lactation period, resulting in loss of valuable cattle wealth. The Madras Co-operative Milk Supply Union is running a farm in Vattanbadu for the salvage of both she-buffaloes and cows. The animals are maintained in the farm during the dry period and returned to the owners when they are about to calve. A monthly fee of Rs. 8 per animal is charged by the Union. Supervisory and technical staff to look after this scheme are provided by the Government. A similar scheme for salvage of dry cows (in the City of Madras) in the reserve forest of Kambakkam is being run by the Animal Husbandry department itself, though the collection of dry animals in the City is being attended to by the Madras Co-operative Society for the salvage of dry animals.

It may not be out of place here to observe that Government should give top priority to schemes for augmenting the production of *wholesome* (raw) milk through co-operatives and provide all facilities to them to make milk available at prices which the common man can afford to pay as raw milk has undisputed superiority over reconstituted or toned milk as a valuable food.

Topical Notes

(i)

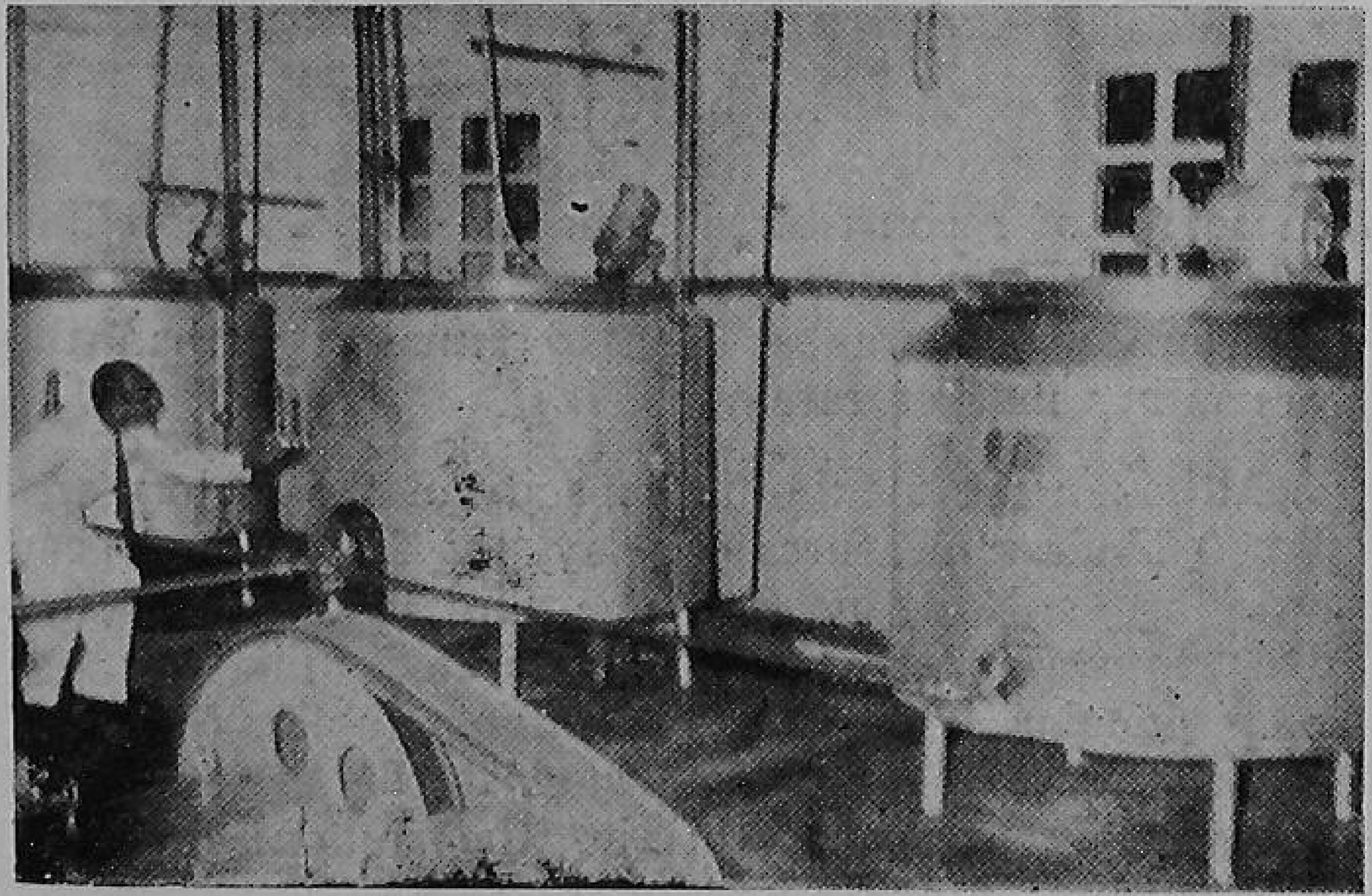
Government Milk Factory, Teynampet

The Government Milk Factory was started in January 1947 by the Government of Madras. The object in starting this Factory was to supplement the existing inadequate supplies of milk caused partly by the influx of population into the City after the mass evacuation during war time and by the extra demands on milk by the armed forces. This factory was started on the model of the Colombo Cold Stores, Limited, which functioning, as a private firm, was supplying the needs of the army during war in the form of reconstituted milk prepared by using Skimmed Milk Powder, Vegetable Fat and Vitamin A. Machinery and plant worth about 3½ lakhs were installed by contract with Binny & Co., Madras. The maximum capacity of the factory was 3,000 Madras measures of reconstituted milk per day. The selling price of reconstituted milk was 14 annas per Madras measure which was at least 6 annas less than the prevailing market rate.

Although the maximum capacity of the factory was 3,000 Madras measures per day, the factory had been working only at nearly one-third of its capacity. Due to various reasons, reconstituted milk was not very popular among the consuming public, the chief reason being the prejudice against the use of vegetable fat or vanaspathi in the manufacture of reconstituted milk.

In March 1953, there was public criticism in the Legislative Council against the use of reconstituted

milk. Therefore, when the question of deciding the future of the factory was taken up, the Government constituted an Expert Committee under the Chairmanship of Dr. A. Lakshmanaswami Mudaliar to examine the working of the factory and to make



Inside the Government Milk Factory where Toned Milk is produced.

recommendations as to how best the milk manufactured might be constituted differently so as to be useful to the general public and serve a good purpose.

The Committee submitted in January 1954 a report along with their recommendations mainly on the following lines :—

(1) That the factory must produce toned milk.

(2) That improved machinery, equipment and laboratory facilities should be provided.

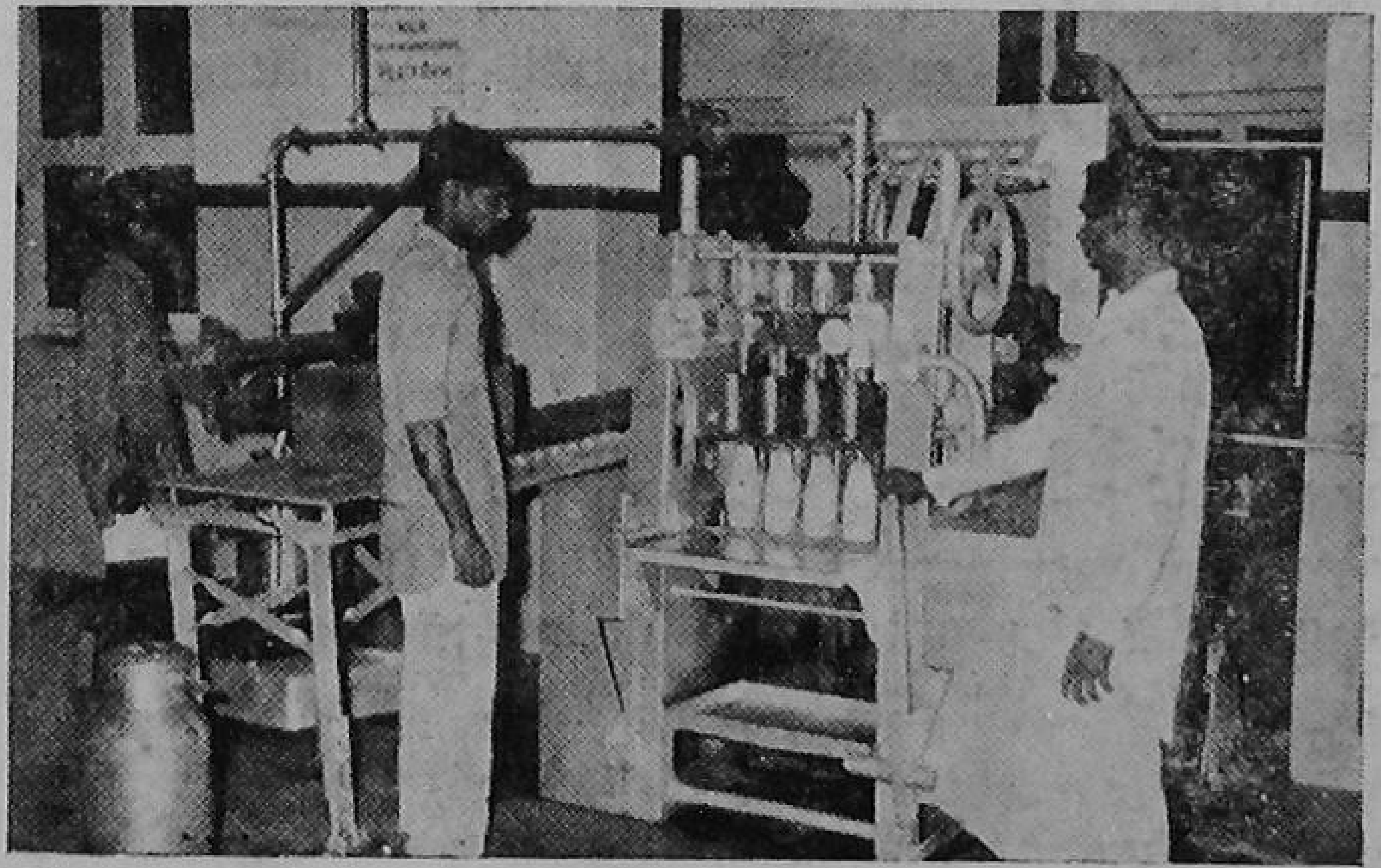
(3) That insulated vans should be provided for distribution of milk.

These recommendations were accepted by the Government and the manufacture of toned milk commenced from 1st July 1955.

Toned milk is prepared from buffaloes milk by the addition of proper proportion of skim milk powder and water and brought to the standard quality of fresh cow's milk in total solids. The process of manufacture consists in mixing all the ingredients in a pasteurising vat, where the temperature is raised to 145°F. holding at that temperature for half an hour

and suddenly cooling by mechanical refrigeration to 40°F. The milk is thus rendered safe for human consumption being rid of all harmful or disease-producing germs. The milk is then immediately filled in tamperproof bottles and sent out by distribution vans. With the introduction of insulated vans, it is expected to deliver milk to the consumer at a temperature very near 40°F so that the consumer gets the milk in exactly the same condition as the milk leaves the factory.

Before the Experts Committee submitted their recommendations, experiments were carried out by the Madras University Head of the Bio-chemistry Department to investigate the biological and nutritive value of toned milk and results of experiments proved that toned milk was equivalent to fresh cow's milk in its nutritive and biological values. This toned milk has been recommended for use by all hospitals and institutions like food catering establishments. The preparation and sale of toned milk is in addition to meeting the shortage of the present milk supply to some extent, making milk available at cheap cost to the low-income groups. The price of toned milk is now one rupee per Madras measure which is 4 annas less than the market rate for cow's milk, for a product equally good in all respects. The quantity of toned milk now produced is about 5,000 lb per day. As the demand for toned milk increases when people begin to realize its value its



Filling the bottles at the Government Milk Factory (Toned Milk).

price is expected to go down as low as 12 annas per Madras measure.

Apart from the nutritive and biological values, and its cheapness, toned milk is also safe from the bacteriological point of view on account of its freedom from the risk of infectious diseases as the milk is manufactured under carefully controlled conditions and quality control exercised at every stage.

Toned milk was originally introduced by the Military Farms in India during World War II and only toned milk is now used by the Land, Air and Naval Forces of the Indian Union and also by the Military Hospitals for the last more than ten years. It has also been very popular in the City of Bombay where a quantity of about 20,000 Madras measures daily is being manufactured and supplied from the Arey Milk Colony.

Starting from the present low per capita consumption of 1½ oz. per head of population in the City, there is bound to be an increasing demand for milk in future. As the public become more and more milk minded, the present supplies will not be adequate to meet the increased demand. Therefore, a scheme for the production of 50,000 lb. or 12,500 Madras measures of toned milk per day has been drawn up and submitted for inclusion in the Second Five-Year Plan. The scheme visualises the construction of a new building in front of the Milk Factory, facing the Mount Road, to have a plant capable of producing 50,000 lb of toned milk per day. The scheme is estimated to cost only about 10 lakhs spread over a period of five years.

(ii)

Dairying Industry in Denmark

Denmark is noted for its milk and milk products. It is a small country with an industrious population which has shown to the outside world the triumph of the co-operative method. The co-operative method had much more than anything else to do with the Danish agriculturist in making him what he is to-day despite heavy odds. Denmark is rightly called the country flowing with milk and honey. It exports annually large quantities of dairy products the income from which keeps the country comparatively in opulent circumstances. The first co-operative dairy was started in the country in 1802. During the year 1835, the famous Royal Danish Agricultural Society was founded. This organization plays a vital role in the economic sphere of the country. There are now no less than 1,700 co-operative dairies in that country. There is plenty of pastoral land in Denmark and not less than 3 million heads of cattle live there. These constitute one of the sure sources of national income of Denmark.

Two or three points regarding dairy industry in Denmark call for mention. One is the elaborate measures that are taken to protect the animals from diseases. These control measures have proved effective in more or less completely immunising Danish cattle from those wasting diseases which affect the cattle in other parts of the world. The second is the hygienic way in which milk is produced. The third is the *esprit de corps* that marks those who are engaged in this industry. They combine for mutual profit and benefit and thus set an example to people in other countries. For yet another point public opinion in Denmark is strong against mal-practices such as adulteration. This has tended to keep the reputation of the industry at a high level.

(iii)

Milk Supply Societies in Madras State

The principle of co-operation has amply demonstrated its value in the sphere of milk supply. In Madras State, there are more than 560 Co-operative Milk Supply Societies and all of them are doing useful service.

The Madras Milk Supply Co-operative Union is the premier institution. From humble beginnings, it has grown to its present stature with 150 feeder societies spread over 600 villages in Chingleput district. The Union is now selling on an average 32,000 lb. of milk of good quality in the City. About 10,000 families earn a supplementary income through the activities of the Union.

Similar co-operative organizations for purposes of milk supply and allied purposes are functioning successfully in almost all important centres in this State. The record of their work shows that while they are able to ensure supply of wholesome milk to the common man they are also able to make a reasonable profit out of their activities. There is no denying the importance of wholesome or pure milk; it has an important contribution to make to the promotion of national health. And without national health no country can make any progress

Appendices

APPENDIX I.

World's Annual Production of Milk.

Country.	*Number of cows (lakhs).*	*Annual Production (lakhs mds.).*	*Milk Yield per cow (lb).*
	EUROPE.		
Albania (1934–38).	..	3·51	..
Austria (1945) ..	11·45	368·42	2,648
Belgium (1945) ..	8·06	623·16	6,362
Bulgaria (1945) ..	..	7·9	..
Czechoslovakia (1946).	..	655·92	..
Denmark	13·91	894·39	5,291
Estonia (1934–38).	..	227·3	..
Finland (1945) ..	11·22	431·60	3,165
France (1945) ..	68·23	2,112·59	2,548
Germany (1946) ..	..	3,535·49	..
Greece (1946) ..	1·17	15·67	1,102
Hungary (1944) ..	16·83	458·51	2,242
Ireland (1945) ..	12·22	593·35	3,995
Italy (1945) ..	32·00	367·56	945
	EUROPE—*cont.*		
Latvia (1934–38) ..	..	442·64	..
Lithuania (1934–38).	..	137·53	..
Luxemburg (1945).	0·48	25·72	4,401
Netherlands (1945).	11·67	692·87	4,885
Norway (1945) ..	7·56	286·43	3,118
Poland (1946) ..	25·39	748·36	2,425
Spain (1942) ..	18·11	522·27	2,405
Sweden (1945) ..	17·97	1,253·97	5,742
Switzerland (1945).	8·05	568·04	5,806
United Kingdom (1945).	24·03	2,236·46	7,658
U.S.S.R. (1934–38).	..	6,241·09	..
Total ..	..	23,457·75	..

APPENDIX II.

Average daily per capita consumption of milk (including products) in different areas.

Area.	*Daily per capita consumption.*
	oz.
PROVINCES.	
Assam	1·23
Bihar	4·37
Bombay	3·02
Central Provinces and Berar	2·00
Delhi	5·53
East Punjab	16·89
Madras	4·18
Orissa	2·64
United Provinces	7·16
West Bengal	2·77
UNIONS AND STATES.	
Baroda	13·57
Hyderabad	3·64
Kashmir	4·54
Madhya Bharat	7·34
Matsya	11·02
Mysore	4·33
Patiala and East Punjab States Union	3·97
Rajasthan	15·72
Sourashtra	18·78
Travancore	1·34
Vindhya Pradesh	3·26
Other Provinces and States	5·87
Indian Union	5·45

APPENDIX III.

Per capita consumption of milk and milk products.

Area.	*Daily per capita consumption.*
	oz.
New Zealand	56
Australia	45
Norway	43
Denmark	40
England	39
Canada	35
America	33
Germany	35
Holland	35
Belgium	35
France	30
Switzerland	29
Poland	22
India	5·48 (5·8)

Per capita consumption of milk only.

Sweden	22·8
Switzerland	22·8
Netherlands	19·2
Canada	18·7
U.S.A.	17·0
Denmark	15·8
U.K.	14·2

APPENDIX IV.

Number of cattle per square mile in different countries.

Australia	5·12	India	122·05
Brazil	16·01	Newzealand	49·01
Canada	2·16	U.S.A.	27·86
Argentina	38·07	Denmark	182·94

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